
3 1761 06705584

AN INDEX OF TREATMENT

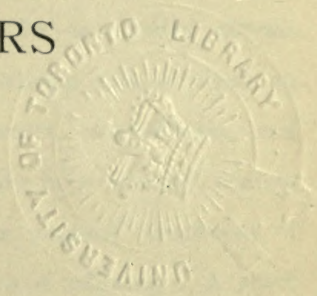
First Edition, November, 1907.
Second Edition, with a few minor alterations, January, 1908.
Third Edition, further revised, April, 1908.
Fourth Edition, fully revised, November, 1908.
Fifth Edition, reprint, January, 1910.
Sixth Edition, revised and enlarged, October, 1911.
Reprinted, May, 1913.
Seventh Edition, revised and enlarged, July, 1915.
Reprinted July, 1917.
Eighth Edition, revised and enlarged, November, 1921.

AN

INDEX OF TREATMENT

BY

VARIOUS WRITERS



Edited by

ROBERT HUTCHISON, M.D., F.R.C.P.

Physician to the London Hospital; and Physician to the Hospital for Sick Children, Great Ormond Street;

AND

JAMES SHERREN, C.B.E., F.R.C.S.

Surgeon to the London Hospital; Consulting Surgeon to the Poplar Hospital for Accidents

1785'5'8.

12.3.23.

EIGHTH EDITION, REVISED AND ENLARGED

BRISTOL: JOHN WRIGHT AND SONS LTD.

LONDON: SIMPKIN, MARSHALL, HAMILTON, KENT & CO. LIMITED.

NEW YORK: WILLIAM WOOD & CO.

1921

PRINTED IN ENGLAND BY
JOHN WRIGHT AND SONS LTD.,
BRISTOL.

PREFACE TO THE EIGHTH EDITION

Opportunity has been taken of the demand for a new Edition of this Index to revise the whole book thoroughly so as to bring it as far as possible abreast of the latest knowledge. With this object some of the articles, such as those on burns, diabetes, electrotherapeutics, hysteria, mental diseases, neurasthenia, and rabies have been entirely re-written, whilst new articles have been inserted dealing with encephalitis, kala-azar, snake-bite, transfusion, the surgical treatment of constipation, and other subjects not dealt with in previous editions. A short introduction concerning some general principles of therapeutics has also been added.

The Editors and Publishers have again to thank numerous reviewers and correspondents who have pointed out omissions and suggested improvements in the last edition. Effect has been given as far as possible to all such criticisms, and it is hoped that in its new form the Index of Treatment may continue to meet with the same large measure of appreciation as it has found hitherto.

Advantage has been taken of the necessity for re-setting the volume to adopt a little larger page and plainer type, thus unifying it in all particulars with the two companion volumes in the same series—The Index of Differential Diagnosis and The Index of Prognosis.

THE EDITORS.

London, November, 1921.



Digitized by the Internet Archive
in 2007 with funding from
Microsoft Corporation

http://www.archive.org/details/indexoftreatment00hutcuoft

LIST OF
CONTRIBUTORS AND THEIR SUBJECTS

JERVOIS AARONS, M.D., M.R.C.P.; Gynæcologist St. Anthony's Hospital, North Cheam; late Pathologist and Registrar to the Hospital for Women, Soho.

Sterility, 878

SIR THOS. CLIFFORD ALLBUTT, K.C.B., M.D., LL.D., M.A. Camb., F.R.C.P., F.R.S., etc.; Regius Professor of Physic University of Cambridge.

Arteriosclerosis, 81

H. RUSSELL ANDREWS, M.D., F.R.C.P.; Obstetric Physician London Hospital.

Chorea Gravidarum, 156—Dyspareunia, 249—Kraurosis Vulvæ, 524—Menorrhagia and Metrorrhagia, 562—Pregnancy (Disorders of), 698—Pruritus Vulvæ, 711—Salpingo-oophoritis, 808—Urethral Caruncle, 953—Uterus (Displacements of), 963—Vaginismus, 965.

GILBERT A. BANNATYNE, O.B.E., M.D., F.R.C.P.; Consulting Physician Royal Mineral Water Hospital, and Royal United Hospital, Bath.

Rheumatoid Arthritis, 783

FREDERICK E. BATTEN, M.A. Camb., M.D., B.C., F.R.C.P. (The Late). (Revised by EDWIN BRAMWELL.)

Migraine, 583—Neuralgia, 628—Neuritis, 636—Palsies (Cerebral, of Childhood), 662—Poliomyelitis (and Acute Encephalitis), 695—Sciatica, 814

VICTOR BONNEY, M.S., M.D., B.SC., F.R.C.S.; Assistant Gynæcological and Obstetric Surgeon Middlesex Hospital; Surgeon Chelsea Hospital for Women.

Puerperal Sepsis, 720

SIR JOHN ROSE BRADFORD, K.C.M.G., C.B., C.B.E., D.SC., M.D., F.R.C.P., F.R.S.; Holme Lecturer on Clinical Medicine University College Hospital Medical School, London; Physician University College Hospital and Seamen's Hospital.

Dropsy (Renal), 240—Nephritis (Acute), 602—Phosphaturia, 678

BYROM BRAMWELL, M.D., F.R.C.P.E., LL.D., F.R.S.E.; Consulting Physician Edinburgh Royal Infirmary.

Heart (Valvular Diseases of), 449

EDWIN BRAMWELL, M.B., F.R.C.P., F.R.S.E.; Physician Edinburgh Royal Infirmary; Lecturer on Clinical Medicine and Neurology University of Edinburgh.

Disseminated Sclerosis, 239—Encephalitis Lethargica, 296—Epilepsy, 305—Myasthenia Gravis, 592—Paralysis Agitans, 665—Paraplegia, 666—Syphilis of the Nervous System, 894—Tabes Dorsalis, 895

JOHN MILNE BRAMWELL, M.B., C.M.

Hypnotism (Treatment by), 478

CHARLES W. BUCKLEY, M.D.; Hon. Physician Devonshire Hospital and Buxton Bath Charity.

Hydrotherapy, 470

J. LEMARE BUNCH, M.D., D.SC., M.R.C.P.; Physician in Charge of Skin Department Queen's Hospital for Children; Physician Hospital for Skin Diseases, Leicester Square.

Pruritus, 707

JAMES CALVERT, C.B.E., M.D., F.R.C.P.; Physician and Joint Lecturer on Medicine St. Bartholomew's Hospital; Consulting Physician Royal Hospital for Diseases of the Chest.

Prescribing, 699

HARRY CAMPBELL, M.D., F.R.C.P.; Physician West End Hospital for Nervous Diseases: Late Physician North-West London Hospital.

Headache, 435

CHARLES W. CATHCART, C.B.E., M.A., M.B., F.R.C.S.; Consulting Surgeon Royal Infirmary, Edinburgh.

Fractures, 349

GEORGE CLARK CATHCART, M.A., M.D., C.M.; Surgeon Hospital for Diseases of Throat, Golden Square.

Adenoids, 13—Laryngitis, 530—Pharyngitis, 673—Tonsillitis (Chronic), 931—Vincent's Angina, 969

ARTHUR HENRY CHEATLE, C.B.E., F.R.C.S.; Lecturer on Aural Surgery King's College Hospital Medical School; Aural Surgeon King's College Hospital, King Edward VII Hospital, and King George Hospital.

Ear (Affections of), 254

WM. HENRY CLAYTON-GREENE, C.B.E., M.B., B.C. Camb., F.R.C.S.; Honorary Consulting Surgeon Richmond Royal Hospital; Lecturer on Surgery St. Mary's Hospital Medical School; Surgeon St. Mary's Hospital, King Edward VII Hospital, and King George Hospital

Abscess, 7—Arthritis (Suppurative), 77—Boils, 99—Carbuncle, 142—Erysipelas, 312—Ganglion, 373—Gangrene, 373—Septicæmia and Pyæmia, 820—Tetanus, 917—Toe-nail (Ingrowing), 927—Tuberculous Glands, 944—Ulcers, 949—Whitlow, 974

E. PERCY CUMBERBATCH, M.A., M.B., B.Ch., M.R.C.P.; Medical Officer in Charge Electrotherapeutic Department St. Bartholomew's Hospital; Physician Electrotherapeutic Department Miller Hospital.

Electrotherapeutics, 275

HENRY CURTIS, M.D., B.S., F.R.C.S.; Surgeon Metropolitan Hospital.

Salivary Glands (Affections of), 802

CHAS. WILBERFORCE DANIELS, M.B. Camb., M.R.C.S., F.R.C.P.; Lecturer Tropical Diseases London Hospital and London School of Medicine for Women; Physician Albert Dock Hospital.

Anæmia (Tropical), 33—Beri-beri, 90—Bilharzia, 96—Blackwater Fever, 98—Cholera, 153—Delhi Boil, 208—Dengue Fever, 206—Diarrhœa (Hill) 220—Diarrhœa (Tropical), 225—Dysentery, 246—Filariasis, 310—Hepatitis, 462—Leprosy, 536—Malaria, 548—Mosquito Bites, 585—Phlebotomus Fever, 678—Plague, 681—Relapsing Fever, 771—Sprue, 869—Sunstroke, 886—Trypanosomiasis, 943—Undulant Fever, 951—Yaws, 990—Yellow Fever, 990

DAVID DRUMMOND, C.B.E., M.A., M.D., D.C.L.; Consulting Physician Royal Victoria Infirmary, Newcastle-on-Tyne; Vice-Chancellor and Professor of Medicine University of Durham.

Aneurysm (Thoracic), 52

CHAS. CROMHALL EASTERBROOK, M.A., M.D., F.R.C.P.; Physician Superintendent Crichton Royal Institution, Dumfries.

Mental Diseases, 566

SIR THOS. CRISP ENGLISH, K.C.M.G., M.B., B.S., F.R.C.S.; Surgeon and Lecturer on Surgery St. George's Hospital.

Biliary Fistula, 96—Breasts (Hypertrophy of), 111—Breast (Neuralgia of), 111—Breast Tumours, 112—Gall-stones (Surgical Treatment of), 372—Hepatic Abscess, 462—Liver (Hydatid Disease of), 539—Liver (Injuries of), 540—Mammary Abscess, 551—Mastitis, 555—Nipple (Diseases of), 640

HAROLD A. T. FAIRBANK, O.B.E., D.S.O., M.B., M.S., F.R.C.S.; Senior Orthopædic Surgeon King's College Hospital; Surgeon to In-patients Hospital for Sick Children, Great Ormond Street.

Balanitis, 89—Metatarsalgia, 583—Paraphimosis, 666—Phimosis, 675—Synovitis (Traumatic), 887—Talipes (Congenital), 905

JAMES STEWART FOWLER, M.D., F.R.C.P.E.; Physician Royal Hospital for Sick Children, and Chalmers' Hospital, Edinburgh; Clinical Lecturer Diseases of Children University of Edinburgh.

Infant Feeding, 489

EDWARD WILBERFORCE GOODALL, O.B.E., M.D., B.S.; Medical Superintendent North-Western Hospital, Hampstead.

Anthrax, 64—Chicken-pox, 151—Diphtheria, 226—Enteric Fever, 297—Erysipelas (other than Surgical), 313—Fevers (Acute Infectious), 323—Glanders, 380—Influenza, 494—Measles, 556—Meningitis (Epidemic Cerebrospinal), 558—Mumps, 592—Scarlet Fever, 810—Small-pox, 827—Typhus Fever, 949

SIR ALFRED PEARCE GOULD, K.C.V.O., C.B.E., M.S., F.R.C.S.; Consulting Surgeon Middlesex Hospital; Consulting Surgeon Royal Hospital for Diseases of Chest, St. Columba's Hospital, and the Hospital for Epilepsy.

Cancer (General Treatment of Patients suffering from), 136

ERNEST W. HEY GROVES, M.S., M.D., B.Sc., F.R.C.S.; Surgeon Bristol General Hospital; Consulting Surgeon Cossham Hospital; Lecturer on Surgery Bristol University; Examiner in Surgery University of London; Surgical Director Pensions Hospital, Bath.

Knee-joint (Internal Derangement of), 520

GEO. LOVELL GULLAND, C.M.G., M.D., F.R.C.P.E.; Professor of Medicine and Clinical Medicine University of Edinburgh; Physician Royal Infirmary, Edinburgh.

Hæmophilia, 417—Leukæmia, 537—Lymphadenoma, 547—Splenic Anæmia, 860

LEONARD G. GUTHRIE, M.A. Oxon., M.D., F.R.C.P. (The Late). (Revised by ROBERT HUTCHISON.)

Albuminuria (Orthostatic, Cyclical, or Functional), 18—Aphasia, 66—Apoplexy, 67—Chloroform or Post-anæsthetic Poisoning (Delayed), 152—Chorea (Chronic), 156—Convulsions (Infantile), 190—Enuresis (in Childhood), 300—Hemiplegia, 456—Laryngeal Stridor, 529—Laryngismus in Childhood, 529—Night Terrors, 639—Nystagmus and Head-nodding, 652—Tetany in Childhood, 918—Vomiting (Cyclical), 972

WILFRED J. HADLEY, M.D., F.R.C.P., F.R.C.S.; Physician, Pathologist, and Lecturer in Medicine London Hospital; Physician City of London Hospital for Diseases of the Chest.

Asthma (Bronchial), 78—Bronchiectasis, 118—Bronchopneumonia (Catarrhal), 125—Pleurisy, 681—Pneumonia, 684

WM. ILBERT HANCOCK, F.R.C.S. (The Late). (Revised by W. T. LISTER.)

Episcleritis, 311—Eyelids (Diseases of), 319—Iritis, 501—Lachrymal Apparatus (Diseases of), 524—Ophthalmia (Sympathetic), 658—Orbital Cellulitis, 660

JOHN HAY, M.D., F.R.C.P.; Honorary Physician Royal Infirmary, Liverpool.

Bradycardia, 108—Heart (Irregularity of), 447—Palpitation, 661—Tachycardia, 900

EARDLEY L. HOLLAND, M.D., B.S., F.R.C.S.; Surgeon City of London Maternity Hospital; Assistant Obstetric Physician London Hospital.

Abortion, 5—Amenorrhœa, 22—Dysmenorrhœa, 248—Endometritis (Chronic), 296—Fibroids (Fibromyomata) of the Uterus, 329—Hæmorrhage (Uterine), 421—Leucorrhœa, 537

SIR THOMAS J. HORDER, M.D., B.SC., F.R.C.P.; Physician with charge of Out-patients St. Bartholomew's Hospital; Physician Cancer Hospital, Fulham.

Specific Therapy (Bacteriotherapeutics), 832

WILLIAM HUNTER, C.B., M.D., F.R.C.P.; Senior Physician London Fever Hospital; Physician and Dean Charing Cross Hospital.

Anæmia, 23—Purpura, 744

ROBERT HUTCHISON, M.D., F.R.C.P.; Physician London Hospital, and Physician Hospital for Sick Children, Great Ormond Street.

Acidosis, 10—Acromegaly, 11—Acroparæsthesia, 11—Borborygmi, 108—Breath (Offensive), 117—Chilblains, 151—Cœliac Disease, 163—Colic (in Adults), 164—Colitis, 165—Croup, 199—Diabetes Insipidus, 206—Diarrhœa (Chronic), 218—Drowned (Treatment of the Apparently), 242—Duodenal Ulcer, 244—Dyspepsia, 249—Dyspepsia (Acid), 253—Dyspepsia (in Childhood), 253—Erythromelalgia, 314—Finger Cracks, 330—Flatulence, 331—Gastralgia, 375—Gastric Ulcer, 375—Gastroptosis, 379—Glycosuria, 384—Hæmatemesis, 415—Hæmorrhagic Disease of the Newly-born, 425—Heartburn, 456—Hiccough, 466—Hyperchlorhydria, 477—Intestinal Stasis, 499—Jaundice, 504—Lumbar Puncture, 542—Marasmus, 551—Meningitis (Posterior Basic), 561—Menopause, 561—Nightmare, 640—Nose, Redness of), 648—Obesity, 652—Osteomalacia, 661—Oxaluria, 661—Peritonitis (Tuberculous), 672—Perspiration (Offensive), 673—Poisoning, 691—Priapism, 704—Raynaud's Disease, 767—Scurvy, 818—Scurvy (Infantile), 818—Sea-sickness, 819—Stomach (Dilatation of), 881—Thrush, 923—Uric Acid Gravel, 958—Urticaria, 962—Vomiting (Hysterical), 973—Vulvo-vaginitis, 973—Worms (Intestinal), 980

SIR ROBERT JONES, K.B.E., C.B., F.R.C.S.; Consulting Surgeon Royal Southern Hospital, Liverpool; Surgeon Royal National Orthopædic Hospital; Consulting Orthopædic Surgeon Royal Infirmary, Liverpool. (*Revised by H. A. T. FAIRBANK.)

Flat-foot, Weak Foot, Everted Foot, 330—Hallux Rigidus, 430—*Hallux Valgus and Bunion, 431—Hammer-toe, 432—*Talipes (Acquired), 901

HARRY LAMBERT LACK, M.D., F.R.C.S.; Consulting Aural Surgeon London Hospital; Consulting Surgeon Hospital for Diseases of the Throat, Golden Square.

Alæ Nasi (Collapse of), 18—Anosmia, 64—Epistaxis, 311—Hay Fever, 434—Larynx (Malignant Disease of), 432—Larynx (Tuberculosis of), 535—Nose (Accessory Sinuses of), 641—Nose (Atrophic or Perforating Ulcer of the Septum of), 645—Nose (Foreign Bodies in), 646—Nose (Fractures of), 646—Nose (Polypus of), 647—Nose (Syphilis of), 648—Nose (Tuberculosis of), 649—Nose (Tumours of), 650—Parosmia, 670—Rhinitis, 789—Septum Nasi (Abnormalities of), 820

JAS. ERNEST LANE, F.R.C.S.; Senior Surgeon St. Mary's Hospital and London Lock Hospital; Lecturer on Clinical Surgery St. Mary's Hospital Medical School.

Chancroid, 150—Gonorrhœa, 394—Impotence, 488—Spermatorrhœa, 852—Syphilis, 889

SIR WM. TINDALL LISTER, K.C.M.G., B.A. Camb., M.B., B.C., F.R.C.S.; Surgeon Oculist to H. M. Household; Surgeon Royal London Ophthalmic Hospital.

Asthenopia, 78—Cataract, 144—Conjunctiva (Diseases of), 177—Cornea (Diseases of), 192—Eye (Injuries of), 314—Glaucoma, 380—Lens (Dislocation of), 536—Optic Neuritis, 659—Pterygium, 719—Scleritis, 816—Squint, 870

E. G. Graham Little, M.D., F.R.C.P.; Physician Diseases of Skin St. Mary's Hospital and East London Hospital for Children. Shadwell.

Warts, 974

J. P. Lockhart-Mummery, B.A. Camb., M.B., B.C., F.R.C.S.; Senior Surgeon St. Mark's Hospital for Diseases of Rectum; Consulting Surgeon Queen's Hospital for Children.

Anus (Surgical Diseases of), 65—Carcinoma of the Colon, 143—Colitis (Surgical Treatment of), 167—Collapse, 167—Colotomy, 169—Congenital Dilatation and Hypertrophy of the Colon, 170—Constipation (Surgical Treatment of), 188—Diverticulitis of the Colon, 240—Hæmorrhoids, 426—Proctitis, 704—Pruritus Ani, 710—Rectum (Diseases of), 768—Shock (Surgical), 824

Vincent Warren Low, C.B., M.D., B.S., F.R.C.S.; Surgeon St. Mary's Hospital; Lecturer on Surgery St. Mary's Hospital Medical School.

Bone (Inflammations of), 100—Bone (Tuberculous Disease of), 103—Bone (Tumours of), 106

Arthur P. Luff, C.B.E., M.D., B.SC., F.R.C.P.; Consulting Physician St. Mary's Hospital.

Gout, 409

Thomas D. Luke, M.D., F.R.C.S.: late Medical Superintendent Peebles Hydro.

Atmospheric Treatment, 88—Heliotherapy, 456—Massage, 552—Phototherapy, 678—Thermotherapy, 919

John M. H. MacLeod, M.A., M.D., F.R.C.P.; Physician Diseases of Skin Charing Cross Hospital; Physician Skin Department Victoria Hospital for Children; Lecturer on Dermatology London School of Tropical Medicine.

Burns and Scalds, 126

Philip H. Manson-Bahr, D.S.O., M.A., M.D.; Physician Hospital for Tropical Diseases, Endsleigh Gardens, and Albert Dock Hospital; Lecturer London School of Tropical Medicine.

Kala-azar, 518—Pellagra, 671

Alexander Miles, M.D., F.R.C.S.; Senior Lecturer and Examiner Clinical Surgery University of Edinburgh; Consulting Surgeon Leith Hospital; Surgeon Royal Infirmary, Edinburgh.

Joints (Tuberculous Disease of the), 512

H. Crichton Miller, M.D.

Psychoneuroses, 713

Robert Milne, M.S., F.R.C.S.; Surgeon and Teacher Elementary Clinical Surgery London Hospital; Surgical Tutor London Hospital Medical College.

Actinomycosis, 11—Ankylosis of Joints, 60—Bursæ (Affections of), 129—Congenital Dislocation of the Hip, 170—Dupuytren's Contracture of the Palmar Fascia, 245—Knock-knee, 523—Scoliosis, 816—Spina Bifida, 852—Spine (Caries of), 854—Stumps (Treatment of), 883—Tendons (Injuries of), 911—Tendons and Tendon-sheaths (Inflammation of), 914—Torticollis (Congenital), 935—Trigger Finger, 942—Volkmann's Ischæmic Paralysis, 969

Rutherford Morison, M.A., M.B., F.R.C.S.; Consulting Surgeon Royal Victoria Infirmary, Newcastle-upon-Tyne; Professor of Surgery Durham University.

Aneurysm (Surgical Treatment of), 44—Phlebitis, 677—Varicocele, 965—Varicose Veins, 966—Wounds of Arteries and Veins, 985

Edward Reginald Morton, M.D., F.R.C.S.; Lecturer Radiology University of Cambridge and West London Post-Graduate College; Physician in Charge *x*-Ray Department, West London Hospital.

Carbonic Acid Snow (Treatment by) 139—Radiotherapeutics, 750

George R. Murray, M.A., M.D. Camb., D.C.L. Durh., F.R.C.P.; Examiner in Medicine University of Leeds; Professor of Systematic Medicine Victoria University of Manchester; Physician Royal Infirmary, Manchester.

Cretinism, 198—Goitre (Exophthalmic), 385—Goitre (Simple Parenchymatous), 387—Myxœdema, 600—Thyroiditis (Acute), 924

H. Oliphant Nicholson, M.D., F.R.C.P.E.; Senior Assistant Physician Royal Maternity and Simpson Memorial Hospital, Edinburgh.

Eclampsia, 269

Sir Thomas Oliver, M.A. Durh., M.D., F.R.C.P., LL.D.; Consulting Physician Royal Victoria Infirmary, Newcastle-upon-Tyne; Professor of Principles and Practice of Medicine University of Durham.

Caisson Disease, 131—Plumbism, 684

John George Pardoe, M.B., F.R.C.S. (Revised by Hugh Lett.)

Calculus, 132—Cystitis, 201—Hydronephrosis, 469—Prostate (Enlargement of), 705—Pyelitis and Pyonephrosis, 744—Pyelonephritis, 745

T. Wilson Parry, M.A., M.D. Camb.

Seton (Treatment by), 822

Sir Robert W. Philip, M.A., M.D., F.R.C.P.E., F.R.S.E.; Senior Physician Royal Infirmary, and Royal Victoria Hospital for Consumption, Edinburgh.

Hæmoptysis, 418—**Pulmonary Tuberculosis**, 727

Sidney P. Phillips, M.D., F.R.C.P.; Physician London Lock Hospital; Consulting Physician St. Mary's Hospital, London Fever Hospital, and Hospital for Children, Paddington Green.

Bile-ducts (Catarrh of), 95—**Cholecystitis**, 152—**Cirrhosis of Liver**, 157—**Gall-stones**, 370

A. E. Hayward Pinch, F.R.C.S.; Resident Medical Superintendent and General Director Radium Institute, W.

Radium Therapy, 757

Frederick John Poynton, M.D., F.R.C.P.; Physician University College Hospital; Physician Hospital for Sick Children, Great Ormond Street.

Chorea (Acute Rheumatic), 154—**Rheumatism (Acute)**, 771

Robert Jas. Probyn-Williams, M.D. Durh., M.R.C.S.; Senior Anæsthetist and Instructor in Anæsthetics London Hospital; Lecturer on Anæsthetics London Hospital Medical College and London School of Clinical Medicine, Greenwich.

Anæsthetics (Administration of), 34

Thos. Arthur Ross, M.D., F.R.C.P. Ed., Medical Director Cassel Hospital for Functional Nervous Disorders.

Anorexia Nervosa, 63—**Hysteria**, 483—**Neurasthenia**, 632

Paul Bernard Roth, F.R.C.S.; Senior Surgeon and with charge of Orthopædic Cases Kensington and Fulham General Hospital; Orthopædic Surgeon Miller General Hospital, Greenwich.

Corns (Treatment of), 196

Edmund W. Roughton, M.D., B.S., F.R.C.S. (The Late). (Revised by Wilfred Trotter.)

Tongue (Affections of the), 927—**Tongue (Tumours of)**, 930

Percy Sargent, C.M.G., D.S.O., M.A., M.B., F.R.C.S.; Surgeon St. Thomas's Hospital; Surgeon National Hospital for the Paralyzed and Epileptic.

Cerebral Abscess, 149—**Hydrocephalus**, 468—**Intracranial Tumours**, 499—**Spinal Tumours**, 853

Robert Saundby, M.D., F.R.C.P., LL.D., M.SC. (The Late). (Revised by Robert Hutchison.)

Achylia, 10—**Constipation (Habitual)**, 185—**Diarrhœa (Acute)**, 217—**Gastritis (Acute and Chronic)**, 378—**Stomach (Carcinoma of)**, 880

Sir James Sawyer, M.D. Lond., F.R.C.P., F.R.S. Ed. (The Late). (Revised by Robert Hutchison.)

Insomnia, 494

Sir David Semple, D.SC., M.D., D.P.H.; late Director-General Public Health Department, Egypt.

Rabies, 747—**Snake-bite**, 829

James H. Sequeira, M.D., F.R.C.P.; Physician Skin Department, Lecturer on Dermatology, and Medical Officer Light Department London Hospital; Honorary Consulting Dermatologist Military Hospitals, and Dermatologist to the Radium Institute, London.

Hair (Diseases of), 429—**Nails (Diseases of)**, 601—**Rodent Ulcer**, 799

James Sherren, C.B.E., F.R.C.S.; Surgeon London Hospital; Consulting Surgeon Poplar Hospital for Accidents.

Abdominal Injuries, 5—**Appendicitis**, 74—**Birth Palsy**, 97—**Congenital Pyloric Stenosis (Surgical Treatment)**, 174—**Cut Throat**, 200—**Duodenal Ulcer (Surgical Treatment)**, 245—**Facial Spasm**, 322—**Gastric Ulcer (Surgical Treatment)**, 375—**Intestinal Obstruction**, 497—**Intussusception**, 500—**Nerves (Peripheral, Surgical Diseases and Injuries of)**, 616—**Neuralgia (Epileptiform)**, 631—**Neuromata**, 638—**Pancreas (Diseases of)**, 664—**Spine (Fractures and Dislocations of)**, 857—**Stomach (Carcinoma of, Surgical Treatment of)**, 880—**Stomach (Dilatation of, Acute Post-operative)**, 881—**Stomach (Foreign Bodies in)**, 882—**Subphrenic Abscess**, 886—**Wry Neck (Spasmodic)**, 989

A. Rendle Short, B.SC., M.D., B.S., F.R.C.S.; Lecturer on Physiology University of Bristol; Assistant Surgeon Bristol Royal Infirmary; Surgeon Clifton College.

Transfusion, 936

W. Knowsley Sibley, M.A., M.D.; Physician *x*-Ray Department and Honorary Physician St. John's Hospital for Diseases of the Skin.

Keloid, 518—**Scars**, 812

EUSTACE SMITH, M.D., F.R.C.P. (The Late). (Revised by ROBERT HUTCHISON.)

Colic (in Children), 164—Constipation (in Children), 183—Diarrhœa (Infantile), 220—Vomiting in Childhood, 979

LEWIS SMITH, M.D., F.R.C.P.; Physician London Hospital.

Addison's Disease, 12—Lumbago, 540—Vertigo, 969

SIDNEY MAYNARD SMITH, C.B., M.B., B.S., F.R.C.S.; Surgeon in Charge Out-Patients St. Mary's Hospital; Surgeon London Fever Hospital.

Brain (Compression of), 109—Brain (Concussion of), 110—Brain (Laceration of), 111—Cerebral Irritation, 156—Dislocations, 232—Gunshot Wounds, 411—Hæmorrhage (Intracranial), 420—Scalp (Contusions of), 809—Scalp Wounds, 809—Skull (Fractures of), 826—Wounds, 982

EDMUND IVENS SPRIGGS, M.D., F.R.C.P.; Senior Physician Duff House, Banff.

Diabetes Mellitus, 297

GRAHAM STEELL, M.D., F.R.C.P.; Emeritus Professor Victoria University of Manchester; Consulting Physician Royal Infirmary, Manchester.

Angina Pectoris, 58—Myocardial Failure, 593

FRANCIS JAS. STEWARD, M.S., F.R.C.S.; Surgeon Guy's Hospital; Joint Lecturer in Surgery, Guy's Hospital Medical School.

Empyema, 293—Pulmonary Abscess, 727

SIR JAMES PURVES STEWART, K.C.M.G., C.B., M.A., M.D. Ed., F.R.C.P.; Senior Physician Westminster Hospital; Physician Royal National Orthopædic Hospital; Consulting Physician Central London Throat and Ear Hospital; Lecturer on Clinical Medicine Westminster Hospital Medical School.

Alcoholism, 19—Craft Palsies, 198—Cramp, 198—Drug Habit, 242—Facial Paralysis, 322—Meningitis (Acute Infective), 558—Meningitis (Syphilitic and Tuberculous), 560

RALPH STOCKMAN, M.D., F.R.C.P.E., F.R.S.E.; Professor of Materia Medica and Therapeutics University of Glasgow; Physician Western Infirmary, Glasgow.

Rheumatism (Chronic), 781

JOHN THOMSON, M.D., F.R.C.P.E.; Consulting Physician Edinburgh Royal Hospital for Sick Children and Larbert Royal National Institution.

Congenital Pyloric Hypertrophy, 172—Mental Deficiency in Children, 563—Rickets, 795

WILFRED TROTTER, M.D., M.S., F.R.C.S.; Surgeon and Lecturer on Surgery University College Hospital; Assistant Surgeon West End Hospital for Nervous Diseases.

Goitre (Surgical Treatment of), 388—Mouth and Pharynx (Malignant Disease of), 585

JOSEPH GEO. TURNER, F.R.C.S., L.D.S.R.C.S. Eng., Dental Surgeon and Lecturer on Dental Surgery, Royal Dental Hospital, London.

Jaw (Deformities of), 504—Oral Sepsis, 659—Pyorrhœa Alveolaris, 745—Teeth (Caries of), 909

PHILIP TURNER, B.SC., M.S., F.R.C.S.; Assistant Surgeon Guy's Hospital; Demonstrator in Operative Surgery Guy's Hospital Medical School.

Hernia, 462—Testicle (Imperfectly Descended), and Ectopia Testis, 915

ARTHUR FRANCIS VOELCKER, M.D., F.R.C.P.; Physician and Joint Lecturer on Medicine Middlesex Hospital; Consulting Physician Hospital for Sick Children, Great Ormond Street.

Whooping-cough, 976

ERNEST B. WAGGETT, D.S.O., M.A., M.B., B.C.; Surgeon in Ordinary to H.R.H. Princess Christian; Surgeon Nose, Throat and Ear Department Charing Cross Hospital; Consulting Surgeon Throat Hospital, Golden Square.

Foreign Bodies in the Air-passages or Œsophagus, 332—Œsophagus (Surgical Diseases of), 654

J. W. THOMSON WALKER, O.B.E., M.B., F.R.C.S.; Senior Urologist and Lecturer in Urology King's College Hospital; Surgeon St. Peter's Hospital, and Urinary Surgeon Radium Institute, London.

Epididymitis (Tuberculous), 303—Hæmaturia, 415—Hydrocele, 467—Kidney (Movable), 519—Orchitis, 669—Urethra (Rupture of), 952—Urethral Stricture, 954—Urine (Retention of), 959—Urine (Suppression of), 961

NORMAN WALKER, M.D., F.R.C.P.E., LL.D. : Physician Skin Department Royal Infirmary, Edinburgh ; Lecturer on Diseases of Skin University of Edinburgh.

Acne Vulgaris, 10—**Alopecia Areata**, 22—**Eczema**, 273—**Erythema**, 313—**Favus**, 322—**Freckles**, 370—**Herpes**, 465—**Hyperidrosis**, 478—**Ichthyosis**, 487—**Impetigo Contagiosa**, 488—**Lichen Planus**, 539—**Lupus Erythematosus**, 542—**Lupus Vulgaris**, 543—**Molluscum Contagiosum**, 585—**Mycosis Fungoides**, 593—**Pediculosis Capitis**, 671—**Pediculosis Corporis**, 671—**Pediculosis Pubis**, 671—**Pemphigus**, 671—**Pityriasis Rosea**, 681—**Pityriasis Versicolor**, 681—**Psoriasis**, 711—**Ringworm**, 798—**Rosacea**, 802—**Scabies**, 808—**Seborrhœa**, 819—**Sycosis**, 887

CECIL WALL, M.A., M.D. Oxon., F.R.C.P. : Physician London Hospital, and Hospital for Consumption, Brompton ; Consulting Physician Poplar Hospital.

Bronchitis (Acute), 119—**Bronchitis (Chronic)**, 121—**Congestion (Pulmonary) and Œdema**, 175—**Emphysema**, 292—**Hydrothorax**, 477—**Pneumothorax**, 690

ALBERT JAMES WALTON, M.S., F.R.C.S. ; Assistant Surgeon and Demonstrator of Anatomy London Hospital ; Surgeon Poplar Hospital for Accidents. (Revised by E. C. LINDSAY.)

Angina Ludovici, 57—**Jaw (Fractures of)**, 504—**Jaw (Necrosis of)**, 506—**Jaw (Tumours of)**, 508—**Ranula**, 767—**Stomatitis**, 882

SIR HERBERT F. WATERHOUSE, M.D., C.M., F.R.C.S. ; Senior Surgeon and Lecturer on Clinical Surgery Charing Cross Hospital ; Senior Surgeon Victoria Hospital for Children ; Consulting Surgeon Kensington Children's Hospital.

Bier's Hyperæmic Treatment, 90

GEORGE ERNEST WAUGH, M.D., B.S., F.R.C.S. ; Senior Surgeon Hospital for Sick Children, Great Ormond Street ; Surgeon Hampstead General and North-West London Hospital.

Angeiomata, 56—**Cleft Palate**, 159—**Hare-lip**, 432—**Laryngeal Obstruction**, 527

SAMUEL WEST, M.D. Oxon., F.R.C.P. (The Late). (Revised by ROBERT HUTCHISON.)

Nephritis (Chronic), 606—**Uræmia (Renal Toxæmia)**, 951

R. H. ANGLIN WHITELOCKE, M.D., F.R.C.S. ; Litchfield Lecturer in Surgery University of Oxford ; Honorary Surgeon Radcliffe Infirmary, Oxford.

Sprains, 861

LEONARD WILLIAMS, M.D., C.M. ; Physician French Hospital.

Health Resorts, 411

S. A. KINNIER WILSON, M.A., M.D., F.R.C.P. ; Junior Neurologist King's College Hospital ; Assistant Physician National Hospital for the Paralyzed and Epileptic ; Physician Central London Ophthalmic Hospital.

Tics, 924

ROBERT ALFRED WORTHINGTON, O.B.E., M.B., B.C. Camb., F.R.C.S., Surgeon in Charge of Throat, Nose, and Ear Department, Lecturer in Surgical Nursing Royal Devon and Exeter Hospital.

Stammering, 872

LIST OF ILLUSTRATIONS

PAGE

1.—Method of Straightening an Inflamed Tuberculous Knee - - - - 61
2.—Apparatus used to Straighten a Fibrous Ankylosis of the Knee following Tuberculosis - - - - - - - - - - 62
3–4.—Special Splint for Birth Paralysis - - - - - - 97
5–11.—Arbuthnot Lane's Flap Operation for Cleft Palate - - - - -160–162
12.—Method of Performing Colotomy with a Rod or Clip - - - - 169
13.—Diagram of Colotomy, with Paul's Tube tied into upper end of Bowel - - 169
14.—Rectification of an Overriding Toe, causing a Corn - - - - 197
15.—Intubation Instruments - - - - - - - - 229
16.—Reduction of Dislocation of Lower Jaw - - - - - - 232
17.—Reduction of Dislocation of Shoulder by Kocher's method - - - - 234
18.—Reduction of Dislocation of Shoulder by the 'Heel in Axilla' method - - 235
19.—Reduction of Dislocation of Elbow - - - - - - - 235
20.—Showing Position of Bones in Reduction of Metacarpophalangeal Joint of Thumb - 236
21.—Reduction of Dislocation of Hip by method (1) - - - - 237
22.—Reduction of Dislocation of Hip by method (2) - - - - 237
23.—Reduction of Dislocation of Ankle - - - - - - 238
24.—Right Temporal Bone of a Male, age 18 years - - - - - 261
25.—Right Adult Temporal Bone, with Mastoid Cells removed - - - - 262
26.—Right Adult Temporal Bone sectioned, showing Diploetic infantile type of bone - 262
27.—Left Temporal Bone, illustrating the Radical Post-aural Operation - - - 263
28.—Bipolar Needle-holder (Schall) - - - - - - - 283
29.—Dr. Bull's Bath Apparatus - - - - - - - 326
30.—Anatomical details of Air-passages and Œsophagus - - - - - 338
31.—Fishbone in Œsophagus - - - - - - - - 348
32.—Fragment of Bone embedded at Œsophageal Ostium - - - - 348
33.—Illustrating the Ligature Operation for Internal Piles - - - - 428
34.—Complete Single Hare-lip - - - - - - - 433
35.—Incomplete Double Hare-lip - - - - - - - 433
36, 37.—Method of Tapping Hydrocele - - - - - - - 467
38–40.—Application of Drip Sheet - - - - - - - 474
41, 42.—Application of Wet Sheet Pack - - - - - - - 475
43.—Throat Compress - - - - - - - - 476
44.—Four-tailed Bandage applied to a Fractured Mandible - - - - 505
45.—Leather Splint applied to Tuberculous First Metacarpophalangeal joint - - 515
46.—Leather Splint applied to Tuberculous Wrist-joint - - - - 515
47.—Leather Side-splints applied to Tuberculous Ankle-joint - - - - 516
48.—Punch Forceps for Removal of the Epiglottis - - - - - 535
49.—Leduc's Tube for Insufflation by Patient - - - - - - 536
50.—Complete Peripheral Nerve Anastomosis - - - - - - 619
51.—Partial Peripheral Anastomosis - - - - - - - 619
52.—Complete Central Anastomosis - - - - - - - 619
53.—Partial Central Anastomosis - - - - - - - 619
54.—Von Hacker's Tube for Dilating Strictures - - - - - 657
55.—Illustrating the Operation of Circumcision - - - - - 676
56.—Celluloid Splints, for Acute Poliomyelitis - - - - - - 696
57.—Walking Apparatus, for Acute Poliomyelitis - - - - - 696
58.—Anterior Turbinectomy - - - - - - - - 792
59.—Method of shaping wire loop of Snare for use in Posterior Turbinectomy - - 793
60.—Posterior Turbinectomy, showing Snare in position - - - - 793
61.—Rodent Ulcer of twelve years' duration. Cured by *X* rays - - - - 801
62.—Rodent Ulcer of four years' duration. Cured by Radium - - - - 801
63.—Symmetrical Enlargement of the Lachrymal, Parotid, and Submaxillary Glands - 804
64.—Seton Knife-needle - - - - - - - - 824
65.—Method of applying Elastic Pressure to Sprained Knee - - - - 863
66.—Method of applying Strapping for a Sprained Ankle - - - - 867
67.—Diagrams showing Exercises in treatment of Stammering - - - - 874
68.—Pneumographic Tracing showing the effect of Alterations in the Intensity of the Voice - - - - - - - - - - 876
69.—Pneumographic Tracing showing the Undulatory character of the Expirations - 877
70.—Malleable Iron Splint for Varus - - - - - - - 906

PAGE

71.—Adams's Varus Splint - - - - - - - - 906
72.—Tin Shoe with Quadrant, for Equinovarus - - - - - - 907
73.—Walking Apparatus, for Congenital Talipes - - - - - 907
74.—The so-called 'Hæmatoma' of the Sternomastoid - - - - 935
75.—Congenital Torticollis in Child - - - - - - - 935
76.—Apparatus for Blood Transfusion - - - - - - - 937
77.—Jeanbrau's modification of Kimpton's method for Blood Transfusion - - 938
78.—Unger's Instrument for Syringe Transfusion - - - - - 939
79.—Unger's Blood Transfusion: Position of Donor and Recipient - - - 939
80.—Robertson's Transfusion Apparatus - - - - - - 939
81.—Vincent's method of Grouping Donors' and Patients' Blood - - - 941
82.—Incision of Finger Tip for Whitlow - - - - - - - 975
83–88.—Methods of Suture for Wounds of Soft Parts - - - - - - 985

AN INDEX OF TREATMENT

INTRODUCTION.

SOME GENERAL PRINCIPLES OF THERAPEUTICS.

In the following pages the treatment of diseases is dealt with in detail; but it may be well, by way of introduction, to state some general principles which apply to every case in which treatment is undertaken.

And first, before beginning treatment, it is essential to have a *plan*, for planless, indeterminate measures are not likely to be successful. The plan should be founded upon the *indications for treatment*—that is to say, with a view to the objects to be achieved, whether these be the cure of the disease or the mere alleviation of symptoms. It is well to remember, in this connection, the limitations of treatment, and not to attempt the impossible. One must always take care also to cut one's therapeutic coat according to one's cloth, and not to embark upon a plan of treatment which the patient's circumstances or means will not enable him to carry out.

Having formed a clearly-defined plan, take care not to change it without some good reason, such as its evident failure, or some alteration in the course and symptoms of the disease. Above all, do not alter the plan merely to conform with the wishes or whims of the patient, still less with those of his friends. The main objects of treatment must be steadily kept in view, and one must refuse to be led off into side-issues.

Let the plan be as *simple* as possible, for, like most good things in life, successful treatment is usually simple. All elaborate and minutely-detailed schemes are to be shunned; they generally partake of the nature of the cure which is worse than the disease. In a word, beware of fussiness.

The plan should not only be simple; it must also be *exact*, and the patient must clearly understand what he is expected to do. This means that any except the most general directions should be put in writing.

In forming the plan, it must always be remembered that one is dealing with a sick man and not with an abstract disease. One must therefore be prepared to *individualize*, or, in other words, to modify details to meet the mental and physical peculiarities of the particular patient. It is for this reason that all cut-and-dried 'systems' of treatment should be avoided.

Faddiness must be eschewed at all costs. It is one of the worst vices that can afflict the therapist. A sense of proportion and of humour are the great safeguards against it, but the doctor should be on his guard when he finds himself beginning to recommend the same sort of treatment for every sort of disease.

Finally, in constructing the plan of treatment, one should be *conservative* but also *eclectic*. Tend rather to adhere to the old and tried methods than to be always running after new gods. Don't be blown about by every wind of doctrine; but

preserve a cool, detached, and rather sceptical attitude to the latest therapeutic craze until its merits have been thoroughly and scientifically tested. It is usually wise to be a little behind the fashion in matters of treatment; but, whilst conservative, one should also be eclectic and ready to accept methods of proved efficacy, no matter whence they come. Do not say, like Caiaphas, "This man speaketh blasphemy", and refuse to hear him. It is possible to get therapeutic hints even from laymen, bone-setters, or Christian Scientists.

In its essence a plan of treatment may be: (1) Radical; (2) Symptomatic; (3) Expectant.

1. By *radical* treatment one means a method which removes the cause of the disease and so automatically effects a cure. Much surgical treatment is of this nature, and in medicine we have examples of it in the cure of malaria by quinine or the removal of a tapeworm by male fern. Unfortunately, radical treatment, though much the most satisfactory, is not always possible.

2. *Symptomatic* treatment is admittedly a *pis aller*. It aims at removing or alleviating the most urgent symptoms in the hope that meanwhile Nature will effect a cure. A very large part of medical treatment is necessarily of this kind. In adopting it one must be sure, of course, that the removal of the symptom complained of is a good thing for the patient. The suppression of the cough in early pleurisy by opiates, for example, is undoubtedly an unmixed benefit to the sufferer, but to deal similarly with the cough in suffocative bronchitis might easily prove disastrous. It may thus be necessary to exercise much discrimination in deciding which symptoms are legitimate objects of attack.

3. *Expectant* treatment consists in preserving a masterly inactivity in the presence of disease, although prepared to intervene on the side of the patient at any time, if need be. It is what the lawyers call 'holding a watching brief' for him. It is not merely, as scoffers think, standing by and patting Nature on the back whilst she does the work; it is something more than that: it is preserving a vigilant attitude, keeping an intelligent eye on the course of events, and meanwhile inspiring the patient with the confidence that his disease is under skilled supervision. In a word, it is the very antithesis of that fussiness in treatment which was deprecated above. In a very large number of cases of disease this is all the 'treatment' that is really required.

Just as a plan of treatment may be either radical or symptomatic, so the agents employed in carrying it out may be described as either *rational* or *empirical*.

Rational agents are those whose success we can clearly understand and account for. The treatment of myxœdema by thyroid gland substance is an instance. Empirical agents, on the other hand, are those whose success has been clearly established by experience, although we are as yet unable to account for it. A large number of our most valuable drugs are employed empirically. One might instance the use of the salicylates in acute rheumatism, or of colchicum in gout. As knowledge advances, however, methods which were once empirical tend to become rational, as has happened, for example, in the case of the treatment of malaria by quinine and of syphilis by mercury. It is, of course, much more satisfactory to employ rational agents, but it would be folly to decline to adopt a method of treatment merely because one does not understand its *modus operandi*. If its value is attested by universal experience one is amply justified in having recourse to it.

The carrying out of any plan of treatment involves the consideration of the following different lines of attack:—

1. *The General Management of the Patient.*—This includes the question of whether it is necessary to carry out the treatment with the patient in bed, or to what extent rest from work is essential, whether he requires skilled nursing, etc. In a word, it includes a consideration of the patient's whole environment, so as to put him in the best conditions possible for fighting his disease. It has largely to do with what is sometimes called 'maintaining his strength'.

2. *Dietetic Treatment.*—Having arranged the patient's environment, the next thing to be done is to decide upon the diet suitable for his disease. In a great many cases this may safely be left to his own choice, and indeed it is a good rule not to lay down any special rules of diet without strong reason. In acute cases a special menu should be prescribed; in chronic cases it is more convenient simply to forbid those articles which are likely to prove harmful. All such instructions should be in writing. Throughout this book the dietetic treatment of particular diseases is considered in detail whenever diet plays an important part in the treatment; but it may be pointed out here that in dietetic, more perhaps than in any other form of treatment, the importance of individualizing must be borne in mind. Before recommending any article of food, therefore, it is wise first to ascertain how the patient likes it and how he has found it agree with him. Further, unless there is some reason to the contrary, one should always pay attention to a patient's likes and dislikes and to his instinctive 'cravings', for, as Sydenham said, "More importance is to be attached to the desires and feelings of the patient, provided they are not excessive or dangerous, than to doubtful and fallacious rules of medical art". Above all, one must avoid all arbitrariness in laying down rules of diet, and should never forbid any article of food without being able to give a good reason for doing so. Finally, if any food disagrees with a patient, it is better to reduce its amount in the diet rather than to eliminate it altogether, and one should also remember to make any serious alterations in the diet rather gradually, as abrupt changes are often ill-supported.

3. *Medicinal Treatment.*—It is difficult to form a just estimate of the part played by drugs in treatment. There was a time, undoubtedly, when they were used too much, but there is now a tendency in some quarters to use them too little. Perhaps the truth as to their value is rightly expressed in the statement that they "sometimes cure, often relieve, and always console". In many cases, of course, the use of drugs need form no part of the plan of treatment at all. Even in such cases, however, it may be advisable for the sake of their 'consolatory' effect to prescribe what is called a *placebo*—especially when one is dealing with unintelligent patients.

It is wise to have only a few drugs in one's armoury, but to know them thoroughly, and if one decides to employ them to do so boldly and in sufficient doses. In using them, also, it is advisable to avoid what is called 'polypharmacy', and to make one's prescriptions as simple as possible, especially when one is employing powerful remedies. The art of combining drugs effectively and elegantly in a 'prescription' is, it must be confessed, not so well understood to-day as it was a generation or two ago, but for practical hints on this important matter the reader should consult the article on Prescribing.

4. *Specific Treatment.*—A 'specific' used to be defined as "an agent possessed of peculiar efficacy in the treatment of a particular disease". In this sense mercury is a specific for syphilis, quinine for malaria, and so on. At the present time, however, the term has come to mean treatment by bacteriological agents, and it is in this sense that 'specific treatment' is used in the article on the subject in this book. It is a subject which is constantly growing in complexity and importance, and the

preserve a cool, detached, and rather sceptical attitude to the latest therapeutic craze until its merits have been thoroughly and scientifically tested. It is usually wise to be a little behind the fashion in matters of treatment; but, whilst conservative, one should also be eclectic and ready to accept methods of proved efficacy, no matter whence they come. Do not say, like Caiaphas, "This man speaketh blasphemy", and refuse to hear him. It is possible to get therapeutic hints even from laymen, bone-setters, or Christian Scientists.

In its essence a plan of treatment may be: (1) Radical; (2) Symptomatic; (3) Expectant.

1. By *radical* treatment one means a method which removes the cause of the disease and so automatically effects a cure. Much surgical treatment is of this nature, and in medicine we have examples of it in the cure of malaria by quinine or the removal of a tapeworm by male fern. Unfortunately, radical treatment, though much the most satisfactory, is not always possible.

2. *Symptomatic* treatment is admittedly a *pis aller*. It aims at removing or alleviating the most urgent symptoms in the hope that meanwhile Nature will effect a cure. A very large part of medical treatment is necessarily of this kind. In adopting it one must be sure, of course, that the removal of the symptom complained of is a good thing for the patient. The suppression of the cough in early pleurisy by opiates, for example, is undoubtedly an unmixed benefit to the sufferer, but to deal similarly with the cough in suffocative bronchitis might easily prove disastrous. It may thus be necessary to exercise much discrimination in deciding which symptoms are legitimate objects of attack.

3. *Expectant* treatment consists in preserving a masterly inactivity in the presence of disease, although prepared to intervene on the side of the patient at any time, if need be. It is what the lawyers call 'holding a watching brief' for him. It is not merely, as scoffers think, standing by and patting Nature on the back whilst she does the work; it is something more than that: it is preserving a vigilant attitude, keeping an intelligent eye on the course of events, and meanwhile inspiring the patient with the confidence that his disease is under skilled supervision. In a word, it is the very antithesis of that fussiness in treatment which was deprecated above. In a very large number of cases of disease this is all the 'treatment' that is really required.

Just as a plan of treatment may be either radical or symptomatic, so the agents employed in carrying it out may be described as either *rational* or *empirical*.

Rational agents are those whose success we can clearly understand and account for. The treatment of myxœdema by thyroid gland substance is an instance. Empirical agents, on the other hand, are those whose success has been clearly established by experience, although we are as yet unable to account for it. A large number of our most valuable drugs are employed empirically. One might instance the use of the salicylates in acute rheumatism, or of colchicum in gout. As knowledge advances, however, methods which were once empirical tend to become rational, as has happened, for example, in the case of the treatment of malaria by quinine and of syphilis by mercury. It is, of course, much more satisfactory to employ rational agents, but it would be folly to decline to adopt a method of treatment merely because one does not understand its *modus operandi*. If its value is attested by universal experience one is amply justified in having recourse to it.

The carrying out of any plan of treatment involves the consideration of the following different lines of attack:—

1. *The General Management of the Patient.*—This includes the question of whether it is necessary to carry out the treatment with the patient in bed, or to what extent rest from work is essential, whether he requires skilled nursing, etc. In a word, it includes a consideration of the patient's whole environment, so as to put him in the best conditions possible for fighting his disease. It has largely to do with what is sometimes called 'maintaining his strength'.

2. *Dietetic Treatment.*—Having arranged the patient's environment, the next thing to be done is to decide upon the diet suitable for his disease. In a great many cases this may safely be left to his own choice, and indeed it is a good rule not to lay down any special rules of diet without strong reason. In acute cases a special menu should be prescribed; in chronic cases it is more convenient simply to forbid those articles which are likely to prove harmful. All such instructions should be in writing. Throughout this book the dietetic treatment of particular diseases is considered in detail whenever diet plays an important part in the treatment; but it may be pointed out here that in dietetic, more perhaps than in any other form of treatment, the importance of individualizing must be borne in mind. Before recommending any article of food, therefore, it is wise first to ascertain how the patient likes it and how he has found it agree with him. Further, unless there is some reason to the contrary, one should always pay attention to a patient's likes and dislikes and to his instinctive 'cravings', for, as Sydenham said, "More importance is to be attached to the desires and feelings of the patient, provided they are not excessive or dangerous, than to doubtful and fallacious rules of medical art". Above all, one must avoid all arbitrariness in laying down rules of diet, and should never forbid any article of food without being able to give a good reason for doing so. Finally, if any food disagrees with a patient, it is better to reduce its amount in the diet rather than to eliminate it altogether, and one should also remember to make any serious alterations in the diet rather gradually, as abrupt changes are often ill-supported.

3. *Medicinal Treatment.*—It is difficult to form a just estimate of the part played by drugs in treatment. There was a time, undoubtedly, when they were used too much, but there is now a tendency in some quarters to use them too little. Perhaps the truth as to their value is rightly expressed in the statement that they "sometimes cure, often relieve, and always console". In many cases, of course, the use of drugs need form no part of the plan of treatment at all. Even in such cases, however, it may be advisable for the sake of their 'consolatory' effect to prescribe what is called a *placebo*—especially when one is dealing with unintelligent patients.

It is wise to have only a few drugs in one's armoury, but to know them thoroughly, and if one decides to employ them to do so boldly and in sufficient doses. In using them, also, it is advisable to avoid what is called 'polypharmacy', and to make one's prescriptions as simple as possible, especially when one is employing powerful remedies. The art of combining drugs effectively and elegantly in a 'prescription' is, it must be confessed, not so well understood to-day as it was a generation or two ago, but for practical hints on this important matter the reader should consult the article on Prescribing.

4. *Specific Treatment.*—A 'specific' used to be defined as "an agent possessed of peculiar efficacy in the treatment of a particular disease". In this sense mercury is a specific for syphilis, quinine for malaria, and so on. At the present time, however, the term has come to mean treatment by bacteriological agents, and it is in this sense that 'specific treatment' is used in the article on the subject in this book. It is a subject which is constantly growing in complexity and importance, and the

1. **Threatened Abortion.**—In all cases absolute rest in bed is essential. No treatment is effective when this precaution is neglected. The patient should be kept strictly in the recumbent position. The only drugs likely to arrest the activity of the uterus are sedatives: a hypodermic injection of $\frac{1}{3}$ gr. of morphia should be given at once, and for the next three days $\frac{1}{2}$-drachm doses of tincture of opium three times a day. Chloral hydrate and bromides may be given instead of opium, if preferred. Strong purges and enemata are to be avoided. The treatment should be persisted in for a week after the symptoms have subsided. If, in spite of treatment, the bleeding becomes severe, abortion must be induced. The arrest of abortion in the threatened stage is more likely to fail than to succeed; success is more likely in cases where there is bleeding only, without pains. Even after attacks of severe bleeding in the early months, pregnancy may continue to term and result in the birth of a healthy child, and it is not at all uncommon for slight bleeding to continue, off and on, for a considerable time without the course of pregnancy being interfered with. In the latter class of case, the question often arises as to how long it is worth while allowing bleeding to continue in spite of treatment (the cases referred to are of course those in which the bleeding is too slight appreciably to affect the health). No hard-and-fast rule can be laid down, but it may be stated that there is not much chance of saving the ovum if the bleeding continues for more than four weeks; after this period the induction of abortion may be fairly proposed or acceded to.

It is important to remember that even after the symptoms of threatened abortion have subsided, the ovum may be dead. Such retention of a dead ovum is called 'missed abortion', and can only be diagnosed by noting the cessation of growth of the uterus.

2. **Inevitable Abortion.**—If the pains are strong and the bleeding is not excessive, no interference is necessary. It cannot be too strongly emphasized that, unless special indications exist, there is no more necessity to interfere in the course of a normal abortion than there is in the course of a normal labour. A certain amount of bleeding is a necessary accompaniment of every abortion, and no alarm need be felt unless it is excessive.

It is most important to examine everything that comes away, to ensure that everything is complete. In this respect it is helpful to bear in mind the manner in which the ovum comes away at the different periods of pregnancy. Up to eight weeks the ovum separates from the uterus through the decidua, which is very thick and vascular; usually the ovum is expelled covered with blood-infiltrated dicidua, but sometimes it is expelled by itself, as a shaggy chorionic vesicle, the decidua separating and following later. From the eighth to the twentieth week the placenta plays the chief rôle, and often separates with difficulty; sometimes the whole ovum is expelled intact, but more often the fœtus escapes first, and the placenta separates and follows later, or may be retained for an undue length of time. The latter is the commonest form of 'incomplete abortion'. From the twentieth week onwards, an abortion resembles labour on a small scale, the birth of the placenta following that of the more bulky fœtus.

The indications for active interference are well defined, and are: (1) Excessive bleeding; (2) Delay, from slow dilatation of the cervix; (3) Retention of part of the ovum (incomplete abortion); (4) Infection of the uterine contents. Active interference will consist, of course, in an operation for emptying the uterus, the method chosen being the one which most suits the requirements of the case. Three points must be emphasized: an anæsthetic must be given, strict antiseptic precautions must be taken, and the manipulations must be gentle and deliberate, as the uterine wall is easily torn or perforated. If the course of an abortion be very slow, or if it is decided to empty the uterus in a case of persistent bleeding, the best treatment is to introduce one or more laminaria tents into the cervical canal and leave them there for twelve hours. If the dilatation has then progressed satisfactorily, the uterus may be emptied by the finger; or further dilatation by Hegar's dilators may be necessary before this can be done.

If, during the course of an abortion, it is found that the whole or part of the placenta has been retained, it is absolutely necessary that it be removed at once. If this is not done, the placenta may decompose, and serious infection may result. To remove it is quite easy with the help of an anæsthetic, and no instruments are necessary. The placenta can be detached and removed best by the fingers of the right hand, whilst the

left hand pushes the uterus down so as to enable the fingers of the right hand to reach the fundus.

In cases where the bleeding has been severe and the patient is collapsed, it is dangerous to empty the uterus at once, if this entails further dilatation of the cervix and separation of the ovum. In such cases it is best to plug the cervix and vagina tightly with sterile gauze, the effect of which is to excite contractions, stop the bleeding, and dilate the cervix. The plug is left in for from sixteen to twenty-four hours. When it is removed, the ovum is often found lying on it, or there will be sufficient dilatation of the cervix to allow the uterus to be evacuated; if further dilatation of the cervix is necessary, Hegar's dilators are used.

In cases where the retained placenta is infected, as indicated by the odour of decomposition or the existence of fever, its removal is attended by a serious risk to the patient of a general infection. In such cases the use of tents or of a plug is contra-indicated; the cervix should be dilated with Hegar's dilators, and the uterus irrigated with an antiseptic solution immediately after removal of the retained tissue.

A word of warning is in place here about the use of the ovum-forceps and the curette. The best and safest instrument to use for separation and removal of the ovum, or for a retained piece of placenta, is the gloved finger. By no other means can it be settled that the uterus is empty. It is easy, by blind groping with the ovum-forceps, to seize and tear away a piece of the uterine wall. Sometimes, of course, there are circumstances when there is not enough dilatation to allow the finger to be introduced, and in these cases the ovum-forceps must be used, but with extreme care. It is never necessary to use the curette. These remarks apply especially to infected cases.

After an abortion the patient should be advised to lie in bed for at least a week. No douches are necessary.

Eardley Holland.

ABSCESS.—The localized collection of pus to which the term abscess has been given is in all cases treated by incision. At the same time it is necessary to recognize certain stages in the formation of the abscess which have some bearing upon treatment, and further, the steps that should be taken to provide adequate drainage and healing.

When an infective process, upon which the formation of an abscess depends, occurs in a superficial region, steps may be taken to cut short the development of the suppuration, as for example in cases of cellulitis and diffuse phlegmons. Free incisions, in such circumstances, followed as they are by the exit of the toxins and by the advent of protective and immunizing lymph to the infected area, are beneficial and advisable; but when the source of trouble lies at some distance from the surface, and where perhaps from the anatomical relations of the part it is desirable to give nature a chance either of effecting resolution of the inflammatory exudate or of determining it into a definite abscess, local applications —fomentations or hot irrigations—are to be employed.

As soon as pus has made its presence manifest, either by the phenomenon of fluctuation or by a softening or bogginess in an area of induration, no time should be lost in giving it a ready exit. All abscesses should be opened as soon as they have declared themselves; and they should be opened freely, with due respect to the anatomy of the part concerned, and in such a position that drainage of the contents is favoured.

If important structures are likely to be encountered or injured, Hilton's method should be employed: this consists in incising the tissues down to the deep fascia, and inserting a director into the most prominent part of the swelling, or where fluctuation is most obvious, until the pus flows along the groove. The opening is then enlarged with sinus forceps or Spencer Wells forceps, until a track of sufficient size has been established. When once the opening has been made, it is usually unnecessary to do more than insert a drainage tube, so that the discharge may find a ready exit. There is no great objection to the irrigation of the cavity with weak antiseptics, though it does no more than wash away the clot which has collected in the cavity. Strong antiseptics and scraping of the cavity wall are in most cases injurious, since the protective barrier of granulation tissue is damaged, fresh lymphatic spaces are opened up, and young vessels are torn across. The necrotic material which often lies against the granulation tissue wall is soon cast off, and can be gently syringed away at the daily dressing. Scraping and strong antiseptics do not facilitate its separation.

Drainage.—All abscesses require drainage, though the duration and form of this drainage vary in individual cases. The object is twofold: first, to allow the necrotic tissue, which must separate from the healthy granulations, to come away; secondly, to prevent the superficial opening from closing before the deeper parts have become clean and healthy. Two chief agents are in vogue for procuring drainage, viz., strips of gauze and rubber tubes (occasionally glass); sometimes both are combined. Generally a rubber tube of fair size (for the purpose of draining an abscess of any size no tube smaller than a cigarette should be employed) is the best, but where the bleeding is profuse, or where the position of the abscess is unsuitable for tube drainage, as in ischiorectal abscess, gauze may be substituted. In such cases care should be taken that the gauze is not tightly packed into the cavity, as this prevents shrinkage and contraction, which are essential for healing. Light packing, which can readily be removed, is all that is required.

During the subsequent progress of the case, irrigations of the cavity through the tube once or twice daily are of value, the tubes being gradually shortened as the cavity closes. With regard to the irrigation, it is worth remarking that peroxide of hydrogen, though a remedy of undoubted value, and frequently employed in these cases, must be used with the utmost caution. When brought into contact with blood or proteid matter the oxygen is given off freely, and if it be injected into a cavity from which there is not a very ready exit, the gas so generated may force its way through the walls of the abscess into the cellular tissue, causing serious complications. Drainage should not be too prolonged, since the presence of a tube or strip of gauze is a source of irritation, and sinuses are often caused by a too zealous adherence to the tube over a long period. When the temperature has been normal for four or five days, and the discharge has become clean, thin, and sweet, it is time to think of withdrawing the drain. No definite rules can be laid down, but provided that the superficial opening is kept patent by a small plug, it is often very advantageous to remove the drainage early.

Rest is an important factor in the healing of abscesses. Neglect of this detail is another cause of troublesome sinuses. The part should be immobilized as far as possible. Splints, bandages, or whatever apparatus may be most suitable, should be applied, and, in cases where the conditions of the part permit, gentle pressure will assist the natural process of contraction and obliteration of the cavity.

It is often possible to sterilize an abscess cavity by the use of Carrel's tubes and Dakin's solution, in a comparatively short time, so that a secondary suture can be undertaken; this method has been employed in empyemata thoracis, and it is claimed by some surgeons that the period of drainage and convalescence is markedly shortened when this treatment is adopted. There is no doubt that Carrel's tubes and Dakin's solution properly applied will clean up an appendicular or other abscess very quickly.

Anal Abscess may be described as a modification of the ischiorectal variety. It is much commoner, and arises from infection of the sebaceous glands and lymphoid tissue which surround the anal orifice.

The treatment should be conducted on precisely similar lines to those used in ischiorectal abscess, and later, if necessary, any fistula can be dealt with.

Axillary Abscess usually arises from suppuration in the cellular tissue or glands of the axilla. The abscess lies beneath the deep fascia, and should be opened by a vertical incision on the inner axillary wall in order to avoid important structures, and the pus should be reached by Hilton's method.

Cerebral Abscess.—(*See* Cerebral Abscess.)

Ischiorectal Abscess occurs after infection of the fat in the ischiorectal fossa, the infection passing in from the bowel, either through a gross abrasion, such as may be produced by a foreign body, or ulcer, or by means of lymphatic communication. There are two well-recognized varieties of ischiorectal abscess: the acute form, caused in most instances by the *Bacillus coli* or other pyogenic organisms; and the tuberculous. The ordinary variety is treated by free incisions, which should extend widely across the buttock at right angles to the anus, and in most cases it is advisable to make crucial incisions over the centre of the fossa, removing subsequently all undermined skin; the finger should then be introduced and all loculi broken into. The cavity should be lightly packed with gauze and allowed to granulate from the bottom.

Cases of ischiorectal, and for the matter of that anal, abscesses, illustrate the

importance of rest in order that perfect healing may be secured. The common result of these abscesses is that after they have discharged their contents a sinus or fistula is formed, owing to the movement of the part and the bad circulation, and a subsequent operation is necessary to effect its cure. For this reason it has been advocated that in all such cases the external sphincter should be divided, and the abscess cavity made continuous with the lumen of the anus, so that the frequent contractions of this muscle shall not interfere with the healing process. This treatment is advisable if, at the time of active treatment, a fistulous communication with the bowel is evident, but it is unwise as a routine. If the patient is kept rigidly in bed, lying for the most part on the face or opposite side, healing may occur perfectly. In no circumstance should he be allowed to get up until a thorough trial of rest has been made. If this treatment be combined with daily dressing and the application of lotio rubra and stimulating injections, in a fair proportion of cases the formation of a fistula may be avoided.

The treatment of the tuberculous variety is conducted on the same principles, but it is often advisable to scrape out the walls of the cavity after the pus has escaped. As a rule the simpler the operation the better in these cases, and as soon as possible the patient should be sent away to the seaside, while those remedies which are of value in combating tuberculosis elsewhere should be actively employed.

Mammary Abscess.—(*See* MAMMARY ABSCESS.)

Palmar and Plantar Abscesses are caused by punctured wounds, or as the result of a spreading whitlow. They should be opened by appropriate incisions, and the position of the arterial arches should be carefully borne in mind, since hæmorrhage in wounds of this kind is troublesome and often serious. If the pus has tracked back through the interosseous spaces, a counter-opening should be made on the dorsum. After incision the whole limb should be placed on a splint and kept at rest ; but as soon as the temperature is normal and the wounds are healthy, careful movement of the fingers should be undertaken to diminish the stiffness, a usual sequela from the adhesions which have formed in the synovial coverings of the tendons. (*See* WHITLOW.)

Peritonsillar Abscess or **Quinsy** is the usual termination of the parenchymatous form of tonsillitis. The pus is formed outside the tonsil, and this gland is pushed towards, often across, the middle line by the exudation. The abscess cavity lies between the tonsil and the superior constrictor, and while the tonsil has been thrust in on the one hand, the internal carotid and the ascending pharyngeal arteries have been displaced outwards on the other. Pus can be detected by a feeling of softening external to the tonsil. In most cases no actual fluctuation can be felt.

Although the opening of a peritonsillar abscess is a simple proceeding, it has on many occasions been attended with serious results. In the first place, no general anæsthetic should be employed, as there is great risk, if the patient is anæsthetized, of the pus running down the larynx after the abscess has been opened. A 10 per cent solution of cocaine should be painted over the back of the throat, and the patient should sit or stand facing a good light. The mouth should be opened as widely as possible, though here the operator will experience difficulty, as the inflammation round a tonsillar abscess often prevents the patient from separating his teeth for more than a half to one inch.

The tongue should be depressed, and the fold formed by the anterior pillar of the fauces be clearly defined. The pus lies immediately behind this fold. A narrow scalpel is taken, guarded to within half an inch of the point with strapping. It is introduced on a level with the soft palate, a cut is made downwards for at least half an inch, and the knife is withdrawn. If the opening is not of sufficient size it should be enlarged with sinus forceps. The patient should be instructed to gargle his mouth repeatedly with hot alkaline solutions, and general tonics and quinine should be administered.

Before leaving the subject it will be well to enumerate some of the dangers, errors, and difficulties in performing this operation. Aneurysm of the internal carotid has been mistaken for a quinsy, and on one occasion it was incised in an out-patient department. Sarcoma of the tonsil appears very like quinsy, but inflammatory signs are absent, the temperature is normal, the glands are enlarged and not tender, and the mouth can be freely opened. The tonsil should not be incised ; this mistake causes considerable pain, and the pus is missed. The internal carotid has been wounded by a careless use of the knife, and some surgeons prefer a pair of sinus forceps instead of the scalpel for the

purpose of evacuating the pus, but if the above directions be followed there is little risk of this untoward accident.

Submaxillary Abscess arises either from suppuration in the submaxillary lymphatic glands or as the result of a cellulitis. Cellulitis in this region is especially serious, owing to the risk of œdema of the glottis supervening. This œdema, which occurs in the arytenoepiglottidean folds, causes occlusion of the superior aperture of the larynx, and fatal dyspnœa often follows an attempt to anæsthetize the patient. In no instance is the beneficial effect of incisions into the indurated area of a cellulitis more marked than in Angina Ludovici (q.v.). The incisions may be made either parallel with and under cover of the border of the lower jaw, or vertically in the median line ; and if there be dyspnœa when the patient comes under treatment, local anæsthesia alone should be employed.

Subphrenic Abscess.—(*See* SUBPHRENIC ABSCESS.) *W. H. Clayton-Greene.*

ACHYLIA (Anacid Dyspepsia).—In the treatment of this condition the food should be finely divided and thoroughly chewed, and should not contain much meat. Perhaps the best thing is to give the following acid mixture after meals, in order to disinfect the gastric contents, and to stimulate the stomach to discharge its contents :—

℞ Acidi Nitrohydrochlorici Diluti
Tincturæ Nucis Vomicæ āā ℿx | Succi Taraxaci ℥j
Aquæ q.s. ad ℥j

Two tablespoonfuls three times a day directly after meals.

Acidol (betain hydrochlorate) splits in the stomach into betain and hydrochloric acid ; it is a means of giving relatively large doses of hydrochloric acid ; it is sold in powder or pastilles, alone or combined with pepsin. Two drachms of dilute hydrochloric acid may be administered in half a pint of well-sweetened water or weak infusion of quassia, and as much as a pint of this mixture may be drunk during the meal (Leo). The administration of pepsin is unnecessary.

Robert Saundby.
(*Revised by Robert Hutchison.*)

ACIDOSIS, or acid-intoxication, is a condition met with in starvation, in obstinate vomiting (especially the pernicious vomiting of pregnancy), in the cyclical vomiting of childhood, in delayed anæsthetic poisoning, in poisoning by salicylates, in diabetes mellitus, and in some severe fevers. Its chief manifestations are thirst, weakness, and depression, with irritability and restlessness, air-hunger, vomiting, and delirium ending in drowsiness and coma.

However brought about, the chief indication in the treatment is to introduce alkalis into the body as quickly and in as large doses as possible. An easily oxidizable carbohydrate, such as glucose, also helps to combat the condition. Bicarbonate of soda may be given in 1-drachm doses by the mouth every three hours ; it is best given dissolved in soda-water sweetened with glucose or honey, or one pint of a 10 per cent solution of dextrose containing 5 to 10 per cent of bicarbonate of soda may be administered per rectum. In urgent cases 2 per cent bicarbonate of soda may be given hypodermically, or 2½ per cent dextrose in 5 per cent solution of bicarbonate by transfusion into a vein. Strychnine, alcohol, and oxygen should be given as stimulants. (*See also* DIABETES and TRANSFUSION.)

Robert Hutchison.

ACNE VULGARIS.—The treatment of this disease depends on the stage which the individual case has reached. In those cases where 'blackheads' are numerous and pustules few, the patient should bathe the face with warm water and apply a sulphur soap, with vigorous friction, for five or six nights a week. The acne skin is greasy, and surprisingly tolerant of irritation, and if the comedones are numerous, one may even recommend the occasional use of a sand soap, such as the 'Monkey Brand'. The friction is an important part of the treatment, for the skin is anæmic and the cutaneous muscles have lost tone, and the hyperæmia which friction causes and the massage of the muscles are both beneficial. In cases where pustules are present, the same treatment may be used less vigorously, unless the reaction is so great as to induce one to apply a soothing lotion for a few days, e.g. :—

℞ Sulphuris Præcipitati
Calaminæ
Zinci Oxidi āā ℥ij | Glycerini ℥j
Aquam ad ℥iv

The pustules, and still more the deeper abscesses which are so commonly present in severe cases, should be opened, and their contents evacuated; but it is not necessary to apply strong antiseptics to their cavities, for these usually heal up readily.

Electricity, in the form of high-frequency currents and *x* rays, is surprisingly successful in some cases of acne, but in others is disappointing.

In about 10 per cent of the cases, or probably less, much improvement follows the administration of the sulphide of calcium, $\frac{1}{6}$ gr. thrice daily; and similar benefit also results in others from the administration of yeast, levurine, or nucleinic acid.

Vaccines of the acne bacillus, either alone or combined with mixed staphylococcal vaccine, will generally hasten the rapidity of the cure. It is not reasonable to expect to cure acne by the injection of staphylococcal vaccine alone.

There is much difference of opinion as to the value of vaccines, and still more as to the proper dose. Some give large doses, others moderate, and yet others small ones; some give them at short and others at long intervals. Some use them in every case, others are very sceptical as to whether they are of any use at all. Without presuming to decide between these conflicting views, it is right to state that my own practice is to give doses of 6 to 10 million at intervals of from ten to fourteen days. More harm seems to result from too frequent than from too large doses.

The diet in acne should be simple, and fats should be taken in moderation; and the usually greasy scalp should be washed frequently. *Norman Walker.*

ACROMEGALY.—The use of pituitary extract in this condition has proved disappointing. Thyroid preparations are worth a trial, as some cases have improved to a certain extent under their use. *Robert Hutchison.*

ACROPARÆSTHESIA.—This condition is characterized by a feeling, which is worse at night, of numbness, tingling, burning, etc., in the hands and arms, and sometimes also in the legs. There are no objective signs. Women about the menopause are most frequently attacked.

Treatment consists in avoiding any work which aggravates the sensations (especially washing), in attention to the general health, and in the administration of tonics. Bromides are specially useful, given either at bed-time or in divided doses throughout the day. Small doses of nitroglycerin may be given along with them. Locally, galvanism gives good results. A. B. C. liniment (aconite, belladonna, and chloroform liniments, B.P. equal parts) may be applied to the hands and arms on going to bed. (*See also* Menopause.) *Robert Hutchison.*

ACTINOMYCOSIS.—This disease most commonly attacks the floor of the mouth or the lower jaw, in both human beings and animals; but in recent years it has been recognized with increased frequency in the abdomen in connection with the appendix, in the chest as the cause of chronic pulmonary disease, and has also been proved to attack the genito-urinary system and the skin. The diagnosis is made clinically by the presence of minute granules in the discharge; commonly they are greyish in colour, but may be yellow or red, and under the microscope can be seen to contain the typical ray-fungus.

Treatment.—1. The administration of potassium iodide internally has been the orthodox treatment for some years. It may have to be given in increasing doses up to 200 gr. a day. It should be well diluted, and although it is depressing, sodium iodide and ammonium iodide are very expensive, and do not seem to have the same effect. We must remember that the organism will grow in a 1 per cent solution of potassium iodide. The drug seems to be useless in pulmonary actinomycosis.

2. Copper sulphate is given (*a*) Internally, in the dose of $\frac{1}{4}$ gr. three times a day; and (*b*) By irrigation. A one per cent solution seems to have a more beneficial effect on sinuses than does the iodide of potassium. Copper sulphate certainly is very effective against the fungus in connection with barley. In France it is said that 2 to 8 gr. per day can be taken by an adult for months without harm.

3. A one per cent solution of iodopin has been tried, and has resulted in cure.

4. *X* rays locally seem to have a definite curative effect.

5. Specific therapy has been tried, but is too recent; still the prognosis is so bad in internal lesions that this treatment certainly ought to be given a chance.

6. *Surgical treatment.* The lesions in connection with the jaw or the floor of the mouth must be thoroughly opened up, masses of infiltrated tissue cut away, and pockets scraped with a sharp spoon. The freer the surgical treatment, the better the prognosis.

The other actinomycotic lesion coming to the surgeon is in the right iliac fossa. It may be discovered in the routine examination of a removed appendix, but more commonly the patient comes with a mass of fibrous tissue, sinuses, and infiltrated skin in the right iliac fossa. Intestinal obstruction is very rare, although the disease may be originating in the colon rather than the appendix. The mass is too hopelessly adherent to attempt removal; but the part may be put at rest by a short-circuiting operation between the small and large gut, and then the lesion in the right iliac fossa treated by free scraping of the sinuses and injection of iodoform emulsion. (*See also* SALIVARY GLANDS, AFFECTIONS OF; *and* JAW, NECROSIS OF.) *Robert Milne.*

ADDISONIAN ANÆMIA.—(*See* ANÆMIA.)

ADDISON'S DISEASE.—Treatment must be considered under two headings: (1) *Specific*; (2) *Symptomatic.*

1. **Specific Treatment.**—It is now generally accepted that the symptoms of Addison's disease result from impairment and, eventually, complete suppression, of the functions of the suprarenal capsules, brought about by disease of the capsules themselves, or of the nerve tracts controlling their function. This suprarenal inadequacy can be actively atoned for only by the administration of its physiological equivalent. In every case, therefore, suprarenal gland substance should be administered. It must be frankly admitted that, so far, the results reported are somewhat disappointing. In some cases there has been no perceptible improvement; in others but temporary benefit has followed; while in some instances remarkably good results have been obtained. These discordances are not difficult to understand; it must be remembered that the exact lesion varies in different cases, that the diagnosis is always difficult, and that too often it is established only at a hopelessly late period of the disease. Moreover, at present we have not learned how to prepare, much less how to administer, suprarenal substance of certain standardized physiological activity. Up to the present the gland substance has usually been given by the mouth, and the suprarenals of sheep have been mostly employed. Tablets of dried extract are prepared, 1 gr. of which corresponds to 15 gr. of the gland substance. Treatment should be begun by one tablet thrice daily, and the dose steadily increased.

So far no bad results have been recorded, though several drachms of gland substance are said to have been given daily with benefit. The treatment should be persisted in, and not remitted when improvement, however well marked, takes place.

If mouth administration fails, hypodermic injections of adrenalin chloride (1–1000) may be tried: fifteen drops, cautiously increased to thirty drops, once daily, should be given for a period of four to six weeks at a time, and the effect on the blood-pressure noted.

Since in most cases of Addison's disease the destruction of the suprarenals is brought about by caseous tuberculous deposits, injections of tuberculin, with a view to the fibrosis of such deposits, has been advocated. In some instances improvement has followed their use. It is wise to begin with a small dose such as $\frac{1}{20000}$ of B.E. once weekly, and steadily increase this to $\frac{1}{2000}$.

2. **Symptomatic Treatment.**—The duration of life in Addison's disease varies from a few days to some years. These wide limits depend, to some extent, on the nature of the destructive agency at work, but probably the difficulty of diagnosis is an important factor. Only too often the cases are seen in the last stages of the characteristic asthenia, when no treatment is of avail. When seen earlier, general treatment is of great importance. The patient must give up all active work, and be content to lead a restricted life, free from all worry and stress. Fresh air and sunshine are of great value. All muscular exertion must be moderate, and if there are any signs of faintness or syncope, he should spend most of his time in the horizontal position.

The diet should be plain, but not too restricted, and meat should be allowed; stimulants are not to be regarded as a necessity for all cases. Sooner or later vomiting usually occurs; the diet must then be regulated, and liquid or predigested foods given; iced

champagne in small quantities is useful. Medicinally, bismuth, oxalate of cerium, and iodine may be tried.

℞ Liquoris Bismuthi et Ammonii Citratis ℥xxx
Acidi Hydrocyanici Diluti ℥iij
Tincturæ Cardamomi Compositæ ℥x
Aquæ Menthæ Piperitæ q.s ad ℥ss

Every three hours.

℞ Cerii Oxalatis gr. ij
In pulv. j. Every four hours.

℞ Tincturæ Iodi ℥j
Glycerini ℥x
Aquæ q.s. ad ℥j

Every two hours till vomiting ceases.

Strong purgatives must always be avoided, in view of the marked tendency in these patients to troublesome and exhausting diarrhœa. Anæmia is sometimes marked, and a combination of iron, arsenic, and strychnine has been found of great benefit.

℞ Ferri et Ammonii Citratis gr. vij
Liquoris Arsenicalis ℥iij
Tincturæ Nucis Vomicæ ℥x
Aquæ Chloroformi q.s. ad ℥ss

Thrice daily in water after meals.

Lewis Smith.

ADENOIDS.—Adenoid growths consist of hypertrophy of the normal lymphoid tissue in the post-nasal space, and may require treatment at various ages, the youngest age at which the writer has operated being four months and the oldest forty-two years. While the condition usually exists along with enlargement of the faucial tonsils, yet the latter may be present without any adenoids, and the adenoids may exist without any enlargement of the tonsils.

The diagnosis depends upon certain signs and symptoms, and it will be best to consider these as they occur in (1) *Infants;* (2) *Children;* (3) *Adults.*

1. *In Infants*, one of the chief symptoms for which advice is sought is snuffling at the nose. Although this is most commonly due to the rhinitis of congenital syphilis, yet a child may be born with snuffles entirely due to adenoids, and in the first few months, apart from syphilis, an adenoid overgrowth may take place sufficiently severe to interfere with nasal breathing. This causes difficulty in suckling, or feeding by the bottle, as the child has to take the lips away from the teat in order to breathe through the mouth, and has therefore to be fed with a spoon. Laryngeal stridor is also a fairly common symptom and, like the lymphoid overgrowth, is frequently connected with the early development of rickets. Snoring is not so common in infants as it is in older children. In infants the use of the post-nasal mirror is impossible, but the diagnosis can be confirmed by digital examination.

2. *In Children* the chief symptoms are (*a*) Nasal obstruction; (*b*) Deafness; (*c*) Both combined.

a. The nasal obstruction gives rise to a typical appearance, called the *adenoid facies*, which is easily recognized by the open mouth, hanging lower jaw, thickened lower lip, and general look of stupidity.

On looking into the mouth the palate is seen to be narrow and highly arched, the teeth are unduly crowded together, and the bridge of the nose is often widened from the congestion of the soft parts, while the alæ nasi are collapsed. Sleeping with the mouth open, snoring, and a peculiar thickness in the articulation are often noticed; but it must be borne in mind that some children do not keep the mouth open at night in spite of considerable nasal obstruction. In these cases the presence of adenoids can be confirmed by the general lack of development, mental and physical, and by deformity of the thorax. Another sign which is often present, and is pathognomonic of their presence, is the occurrence of granulations on the posterior wall of the pharynx, continuing down below the soft palate; this may be accompanied by enlargement of the lymphatic glands along the posterior border of the sternomastoid muscles.

Here, too, rickets may play a large part, either as a concomitant or as a cause of the condition. The important connection between this condition of lymphoid overgrowth and rickets has lately been strongly pointed out by Dr. J. Lawson Dick, "Defective Housing and the Growth of Children".

b. Deafness, which is often put down to wilful inattention, is due to the obstruction of the Eustachian tubes, either by direct pressure of the growths on the mouth of the tubes, especially when they are situated in Rosenmüller's fossæ, or by the post-nasal catarrh set up by their presence, which spreads along the tubes and leads to chronic catarrh of the middle ear. One of the first signs that the Eustachian tubes are becoming affected is the indrawing of the membranæ tympani, and at a later stage the deafness can be confirmed by the usual tests.

In cases where the faucial tonsils (*see* TONSILLITIS) also require removal there is no necessity to examine for adenoids, as this can be done when the patient is under the anæsthetic, and if present they can be removed.

Except in infants, who do not remember the ordeal, the writer never makes a digital examination of the posterior nares. It is a painful proceeding, and extremely terrifying to a nervous

child, and may prevent them ever showing their throat to a doctor again. Moreover, the information afforded by it is often incomplete, for in restless, struggling children the examining finger frequently misses the hypertrophied masses which lie in Rosenmüller's fossæ, and the case is announced to be free from adenoids and, the cause of the deafness being overlooked, it is allowed to go on unchecked. It is in these cases that the use of the post-nasal mirror is so important an aid in locating the growths round the Eustachian tubes. Very often this examination may be made when the child is first seen, but sometimes the nasopharynx is so sensitive that this is impossible. In these circumstances the writer always gives the following prescription for a week :—

℞	Potassii Bromidi (according to age)	gr. v-x		Syrupi Limonis	℥ v
	Liquoris Arsenicalis	℥ ij		Aquæ Menthæ Piperitæ	ad ℥ ij

Two teaspoonfuls to be taken in a large wineglass of water three times a day after meals.

After this preparation the sensitiveness of the nasopharynx is so diminished that a satisfactory examination with the post-nasal mirror becomes possible.

3. *In Adults* who suffer from adenoids, advice is generally sought for three chief reasons :—

a. Chronic post-nasal catarrh.—This often occurs in cases where the adenoids have been imperfectly removed in childhood and have subsequently recurred.

b. Deafness.—This is also a frequent complaint. In adults it should be remembered that chronic otitis media, with indrawing of the membrana tympani, may have supervened, and that therefore a cautious prognosis should be given. Still, as the presence of adenoids tends to keep up the middle-ear catarrh, they should be removed.

c. Muffling of the voice.—This, and a want of nasal resonance, are symptoms which become especially noticeable in singers. It has been said that singers should be operated upon as little as possible. When, however, it is remembered that the nasopharynx is a very important resonator of the voice, and is not a large space even when unobstructed by adenoid growths, it is clear that these should be removed and the space made as large as possible.

In adults the diagnosis can always be made by means of the post-nasal mirror, aided, if necessary, by a spray of 4 per cent cocaine down the nostrils as well as into the pharynx.

Treatment.—The writer has not found nasal drill and breathing exercises of any avail until the adenoids have been removed. When, however, operation is advised, the mother will often raise objections to it : (1) That the family doctor says it is not necessary, as the adenoids will disappear as the child grows up ; (2) That if the adenoids are removed when the child is too young they are sure to grow again ; (3) That as the patients are often in poor health the operation should be postponed until the general condition has been improved.

These objections are misleading, and if not overruled will entail a vast amount of misery and bad health in after life.

1. In regard to their disappearance, it is quite true that when the majority of people reach adult life their adenoids have disappeared ; but by that time the mischief has been done, the face has become permanently deformed, and if deafness has been threatened it has become established, and will gradually get worse.

2. It is also true that they sometimes grow again, especially if the child gets any of the exanthemata or any diseases involving the nasopharynx, such as diphtheria or mumps, as the high temperature accompanying these diseases tends to make all the adenoid tissue hypertrophy. But if the post-nasal space be blocked when the child gets any of these diseases, the risk of the ears becoming affected by acute otitis media is infinitely greater, and the chance of their recovery without having to undergo a mastoid operation is much diminished. It must also be remembered that at the time of puberty there is a normal increase of lymphoid tissue all over the body.

3. In regard to postponing the operation because the child is in poor health, the writer is of the opinion that the presence of the adenoids is the cause of the poor health, and is a standing menace to its well-being. There can be no doubt that the free ventilation of the post-nasal space and its freedom from sepsis in early life is of incalculable benefit in maintaining the health and in preventing disease by increasing resistance to it. Therefore the sooner the adenoids are removed the better for the patient.

Before arranging for the operation, strict inquiry should always be made into the family history of the patient, and, if he comes of a family of 'bleeders', the coagulation time of the blood should be taken. If found below normal, the operation must be postponed until the viscosity has been brought up to the normal by means of injections of iron and arsenic and the internal administration of calcium lactate. As a further precaution 'hæmoplastin', which is a hæmostatic serum prepared by Parke, Davis and Co.,

can be injected an hour before the operation. In the case of girls, inquiry should also be made as to whether they have begun to menstruate, and if so the operation should be done midway between two periods; otherwise the hæmorrhage will be excessive and exceedingly difficult to arrest.

In view of the many cases which have succumbed, during operation, to 'status lymphaticus', it is important to find out if there be any family history of thyroid involvement, such as myxœdema or goitre, as a persistent thymus gland can often be detected by radiography.

The preparation of the patient for operation is important. In very nervous subjects the mixture of bromide of potassium and arsenic, in doses suitable for the age of the patient, should be given for a week beforehand. In adults, the writer always gives 30 gr. of bromide of potassium in a large glass of water the night before. The patient should not be purged before the operation in view of the possibility of acidosis occurring. If the patient be habitually constipated, the bowels should be regulated for two or three days before the operation. The operation is best performed in the early morning, when the stomach is empty. Care should be taken to see that the patient, if nervous, is not awakened too soon before the operation, and that no food, milk, or beef-tea is given in the early morning.

On the Continent adenoids are removed without an anæsthetic; but, owing to the intense nervous impression left upon sensitive children by this proceeding, the writer now always advises operation under a general anæsthetic. The choice lies between open ether, gas and ether, chloride of ethyl, and chloroform. Statisties have shown, however, that ether is by far the safest anæsthetic, and the writer now never employs any other. Nitrous-oxide gas alone, or gas and oxygen, does not give sufficient time unless the operator be specially experienced and skilful, and for young children is not a suitable anæsthetic. Whichever may be chosen it should be given by a skilled anæsthetist. An hour before the operation a hypodermic injection of $\frac{1}{100}$ gr. of atropine should always be given in order to check the flow of mucus which the anæsthetic sets up. It is not advisable to give morphia or its derivatives, as it delays the return of the reflexes of the upper respiratory tract after the anæsthetic has been discontinued.

Before beginning the anæsthetic a small prop should be put in the right side of the mouth to keep the mouth slightly open and admit of better breathing, as the nose is obstructed; it also saves time by facilitating the insertion of the gag. The mouth should also be examined to see if there are any loose teeth which might be knocked out by the gag and swallowed, or perhaps aspirated into the lung; and in the case of adults it is well to inquire if any teeth have been crowned with porcelain, in order that they may be avoided or the gag put on the other side. The anæsthetic should always be given in the recumbent position, with a sufficient number of pillows to make the patient feel quite comfortable. If he be nervous and desires the nurse to hold the hands, the proper way to do it is for the nurse to cross the arms and let the patient take hold of her hands, as if shaking hands, as this is the only kind of grip that gives the patient confidence.

There is another important point which is often overlooked. As a rule a mackintosh cloth is placed under the patient's back, which in hospital is very often not even covered with a towel; but even if it be, it strikes cold through the towel. When the patient is under the anæsthetic the pyjama jacket or nightgown is always taken off, to prevent it being soiled by the blood, and a mackintosh with a towel on it placed over the chest. The patient has thus a cold mackintosh on the back and the front of the chest, while after the operation, when the patient is rolled over on to the side, the back is left exposed to the cold air. Now profuse sweating often takes place under the anæsthetic, especially when ether is being given, and this exposure of the chest to cold when it is in a sweating condition is very apt to bring on an attack of bronchitis or pneumonia, for which the ether is unjustly blamed. This is especially the case in feeble young children with delicate chests, whose power of resistance is low. The best plan is to take a large sheet of ordinary cotton-wool, long enough to cover the chest, back and front. Cut a hole in the centre, put the child's head through it, and fasten it round the body with two turns of a bandage. A large, soft bath-towel or old blanket will serve the same purpose.

When the anæsthetic is once begun, perfect silence should be maintained until the patient is under; nothing is more disturbing to a patient who is half under than talking

or whispering, or the noise caused by turning the instruments out of the sterilizer on to the table with a great bang. When the patient is under, the pillows are removed, and a small sand-bag or hard pillow or rolled-up bath-towel is placed under the shoulders, which are raised high enough to let the head rest on its vertex on the table. In this position the blood runs into the nasopharynx and not into the larynx, and can easily be kept out of the larynx by gentle swabbing. Some operators prefer to have the patient turned on to the right side with the head low and brought to the edge of the table. In this position it is important to operate on the lower tonsil first. But whichever position be chosen, the adenoids should always be removed before the tonsils.

There are two methods of removing adenoids which have to be described: (1) *Operation with Löwenberg's forceps*, or with one of the modifications thereof; (2) *Operation by means of the curette*. The writer no longer uses the curette, but relies entirely on the forceps. It is often difficult to remove the adenoids thoroughly by means of the curette, and very often only the central pad is removed. The growths tend to recur round Rosenmüller's fossæ unless completely removed from these situations, and, if left, the dangers of middle-ear complications are considerable. Moreover, the writer has found that the patients experience far less pain and stiffness of the back of the neck after the operation when this is done with the forceps only, than when the curette is used. On the other hand, it is more difficult to learn to use the forceps than the curette, and the operation takes longer to perform; but the extra time and skill required are well worth while, because in a great many cases it is only by the use of forceps that the adenoid growths can be completely and efficiently removed.

1. **Operation with Forceps.**—The patient having been anæsthetized, a Mason's or other suitable gag should be inserted in the left side of the mouth. If no prop has been used there may be some difficulty in opening the mouth. It can easily be overcome by inserting the forefinger between the jaws at the back of the last molar teeth, or by inserting the end of a tonsil guillotine and so forcing the teeth open.

The operator, standing on the right side of the patient, passes the forefinger of the left hand along the right side of the tongue over the tonsil, until it reaches the posterior wall of the pharynx. He then turns it, with the dorsum of the hand on the tongue, up behind the posterior pillar of the fauces into the post-nasal space, which he examines thoroughly. Still keeping the finger behind the soft palate, and, hooking it forward, he takes the largest pair of forceps that will fit the case, and passes them closed behind his finger. He then opens them as widely as possible, and, keeping them closely pressed against the posterior wall, passes them up, guided by his finger, until as large a mass of growth as possible has been included. The blades are then closed, and with a slight twist and downward pull the mass is removed. The process is repeated until all the central mass is removed. By pressing on the mucous membrane below the forceps, it is easy to prevent its being removed along with the growth. He then takes a smaller pair of forceps and, turning them to either side, thoroughly clears out any growths that may be in Rosenmüller's fossa. It sometimes happens, when the growths are in very great abundance, that pieces get pushed through into the nasal passages, and so cannot be gripped by the forceps. They can be pushed back again by passing a probe or pair of curved dressing forceps down the nose. In some cases the atlas projects forward so much that it prevents the forceps (or the curette) reaching the back wall. This difficulty can be easily overcome by using a pair of Quinlan's forceps, in which the cutting edges project backwards for about half an inch.

When tonsils are to be removed as well, they should be done after the adenoids. Sponging should always be performed gently. On no account should the sponge be rammed into the back of the throat and turned round remorselessly, as if wiping out a glass lamp-chimney.

After the operation the patient should be turned over on to the right side, with the left hip and left shoulder brought well over, and the head brought to the edge of the table. Just before removing the gag the writer is in the habit of applying pure hazeline or Pond's extract by means of small pieces of sponge tightly gripped in the forceps and passed up into the post-nasal space. It acts not merely as a local hæmostatic, but as an antiseptic and local anæsthetic.

As soon as the patient is out of the anæsthetic he should be instructed *not* to try to

blow the nose for two or three days, as the cases of suppurative otitis media that sometimes occur are generally due to blood being forced into the Eustachian tubes at the end of the operation. In this connection it may be well to point out to the parents and the patient that the proper way to blow the nose in order to prevent injury to the ears is always to blow one nostril at a time.

2. **Operation with Curette.**—The operator should be provided with a guarded curette with prongs, and also with an unguarded one. The patient is in the same position as in the previous operation, although when nitrous oxide gas only is used some operators prefer to have the patient sitting up in a chair.

The curette is passed up behind the soft palate until it impinges on the vomer. It is pressed down on the growths, and with a rapid sweep the growths are cut through and brought out attached to the prongs. The unguarded curette is then passed up and turned first to the right and then to the left, care being taken not to injure the Eustachian tube, and is swept down and across to the opposite side. Even after the curette has been used by an efficient operator it is always well to examine with the finger and scrape away any tags that have been left, or remove them by means of the forceps.

After-treatment.—The patient should be kept in bed for two or three days, and in the house for two days more, before being allowed out. He should also, if at all nervous, get a sleeping draught of bromide of potassium for two nights after the operation, and an aperient the second night. Should sickness persist for some time after the anæsthetic, it is a good plan to give 5 to 30 gr. of bicarbonate of sodium in a large tumbler of hot water. This is generally brought up again, and helps to get rid of the blood and mucus in the stomach. Milk should not be given for twelve hours, but weak tea and bread and butter, or beef-tea may safely be taken. Thirst is best controlled by giving alternate teaspoonfuls of very hot and cold water.

When the operation has been primarily undertaken for deafness, it sometimes happens that the depletion of the mucous membrane of the posterior nares causes marked improvement in the hearing, which is noticed as soon as the patient wakes up. But treatment with Politzer's bag should be delayed for at least two weeks after the operation. Before employing it, an alkaline spray (not a douche) should be used for a week, in order to make certain that the post-nasal space is free from any discharge. If no improvement takes place, a very careful examination should be made to find out if the patient is suffering from early otosclerosis as well as Eustachian catarrh. In these distressing cases the author has obtained the best results from treating them with Zund-Burguet's 'électro-phonoïde'.

Breathing Exercises.—Owing to the nasal obstruction these patients have not been able to fill their lungs properly, their chests are not developed, and in some cases have begun to be deformed. It is therefore of the utmost importance that breathing exercises, with special reference to nasal breathing, should be patiently and persistently carried out in a systematic manner until the patients have learned to breathe through the nose at all times, and the chest has become properly developed.

In a great many cases the nares have become so narrowed that on trying to inspire quickly through the nostrils the alæ nasi are drawn in. This condition should always be looked for before the operation, and in the case of very young children the nares can be widened by passing a pair of forceps down them and gently expanding them when under the anæsthetic. Older patients must be shown in a mirror what is being done, and made to practise expanding the nostrils during slow inspiration. From a long experience the writer has found the following exercises the most useful. They are all (except *d*) to be done standing up, with the mouth firmly closed, so that both the inspired and expired air passes through the nose.

They are best done at bedtime and in the morning before dressing, as all tight clothing, such as corsets, braces, and tight waistcoats, renders them nugatory. In fact it would be a good thing if boys learnt to wear their trousers always suspended from the hips by means of a back-strap, as they do when playing games, and not wear braces at all.

a. The first set of exercises should be done against resistance. Three or four times a day the parent or nurse should stand in front of the patient and place the hands at the back of the lumbar region. The patient should then be asked to exhale deeply, so that the ribs go in. The parent's hands are then pressed strongly against the lower ribs at the back. The patient should

concentrate all his attention there, and try to push the hands outwards and backwards, and rather downwards than upwards, while taking in four short breaths through the nose. As the ribs go out and back, the front wall of the abdomen should sink in slightly.

The movement should be a backward one and confined to that part for the time being, and the chest as a whole should not be raised. After this has been accomplished, which may take from a week to a month, the hands should be placed higher up and a little more to the sides, and the exercises repeated. When this also has been successfully accomplished, the hands should be placed in the armpits, with the thumbs pressing strongly on the front of the chest. The patient should first try to separate the hands as far as possible laterally, and then endeavour to push the chest up against the thumbs. In order to prevent the muscles attached to the top of the ribs being brought into play or the shoulders being raised, the head should be allowed to hang forward.

When the patient is old enough he can do these exercises himself by making pressure with his own hands behind, and for the last exercise by putting a tape measure round the chest just above the nipple line and trying to exhale as much as possible, and then expand the chest laterally. As the chest expands it will be found to be rising at the same time, while the abdomen sinks in. The difference between full inspiration and full expiration should be four to six inches.

b. The second exercise should be done standing in front of a looking-glass. The arms should be held out horizontally on a level with the shoulders, the palms facing the mirror. In this position, while taking in as full a breath as possible, the arms should be stretched away from the the body to their utmost extent. In this exercise and the next it will be found that the fuller the breath the more the arms can be stretched and the more the abdomen sinks in. While holding the breath, and keeping the arms fully extended and the head quite steady, facing the mirror, the arms and shoulders should be moved round until the right arm is straight in front and the left arm behind, and then be swung back again. The exercise should be repeated about six times, bringing each arm alternately in front. The rotation, if possible, should take place in the spine, the head should not be moved at all, and the hips as little as possible.

c. In the third exercise the patient should stand with his back against the wall or a door. Both arms should then be raised above the head and stretched as high as possible, while inspiring slowly through the nose. Then, keeping the back of the hands and the elbows against the wall, the arms should be flexed until the hands are on a level with the shoulders. The breath should then be slowly expelled through the nose, the head allowed to fall forward, the shoulders be brought forward, and the chest compressed so as to get rid of all the air possible. This exercise should be repeated six times night and morning.

d. This exercise helps to make the ribs and backbone supple. The patient should lie on his back on the floor, with the arms stretched down by the sides, palms on the ground. The legs are then to be raised and curled over the head, until the toes touch the ground behind. The breath should then be exhaled, and the legs stretched back as far as possible and then brought back again. The exercise should be repeated six times. (*See also* JAWS, DEFORMITIES OF.)

George C. Cathcart.

AEROPHAGIA.—(*See* FLATULENCE.)

AGORAPHOBIA.—(*See* NEURASTHENIA ; PSYCHOTHERAPY.)

AIR-SWALLOWING.—(*See* FLATULENCE.)

ALÆ NASI, COLLAPSE OF.—Alar collapse results from atrophy of the dilator nasi muscles from long disuse in consequence of nasal obstruction. After the obstruction has been removed, the collapse of the alæ may lead to difficulty in re-establishing nasal breathing. This should be overcome by systematic exercises. The patient should be instructed to expand the nostrils against a light resistance made by gently compressing the nostrils with the finger and thumb. This should be done in front of a mirror three or four times daily. Persistence in these exercises generally results in permanent improvement. As a temporary expedient, where the patient finds great difficulty in sleeping or is otherwise much worried by the obstruction, the nostrils may be dilated by inserting a small roll of cotton-wool, about the size of a pea, into the most anterior part of the nasal vestibule on each side ; or various dilators, such as that of Francis, may be used for the same purpose. These generally produce some discomfort, and the patient soon discards them.

H. Lambert Lack.

ALBUMINURIA (Orthostatic, Cyclical, or Functional).—This affection, in which albumin is present in the urine whilst the patient is up and about, but disappears after rest in bed, may be regarded as one of the neuroses of childhood.

There is no evidence that the albuminuria is due to nephritis of any sort, nor that the condition ever leads to granular kidney or to any form of Bright's disease. Treatment by drugs, or by any means aiming at control of the albuminuria, is unsatisfactory, but calcium lactate has been found useful in some cases. Careful dieting, exercise, baths,

and massage are generally inefficacious so far as the albuminuria is concerned, though valuable as means of improving general health.

Cyclical albuminuria is evidence of nervous instability, affecting chiefly the vasomotor system. It is best treated on general principles, which should include a simple, regular course of life, lived as much as possible in the open air, wholesome ordinary diet, and freedom from emotional excitement and overwork at school. The subjects tend to become valetudinarians and hypochondriacs, and therefore should not be treated as invalids.

Tonics, and sometimes sedatives, are necessary, if only to satisfy anxious parents that 'something is being done', and the following prescriptions may be found useful:—

℞ Syrupi Calcii et Ferri Lactophosphatis ℥ss
Ex Aquâ ℥ss three times a day after meals.

℞ Calcii Lactatis gr. v–x | Aquam Destillatam ad ℥ij
Syrupi Aurantii ℥ss |
Three times a day.

or if sedatives seem to be required:—

℞ Ammonii Bromidi | Sodii Hypophosphitis gr. ij–iv
Potassii Bromidi āā gr. iv | Aquam Chloroformi
Liquoris Arsenicalis ♏ij | Aquam Menthæ Piperitæ āā ad ℥ss
℥ij to ℥iv three times a day.

Leonard G. Guthrie.

ALCOHOLISM.—Of the various manifestations of the alcoholic habit which we are called upon to treat, some, such as acute alcoholic poisoning and delirium tremens, are acute; others, such as dipsomania and chronic alcoholism, are chronic. Alcoholic insanity, too, is to be borne in mind, but it does not fall within the scope of the present article.

Acute Alcoholic Poisoning (Alcoholic Coma).—This results from absorption of a quantity of alcohol so excessive as to produce not merely excitement or incoherence, but actual coma. When called to such a patient, proceed without delay to empty the stomach by washing it out through a soft stomach tube. Emetics like apomorphine may produce dangerous depression of the heart, and are, therefore, inferior to gastric lavage with warm water. When the stomach has been completely emptied, before withdrawing the stomach tube, introduce half a pint of hot coffee and a dose of some saline aperient, such as 2 dr. of magnesium sulphate with 20 min. of dilute sulphuric acid in 2 oz. of peppermint water. If there be serious collapse, strychnine must be administered hypodermically, and artificial respiration may be called for if there be respiratory failure. Then allow the patient to sleep quietly, keeping him warmly wrapped up until he comes to himself.

Delirium Tremens.—This is due mainly to the sudden withdrawal of alcohol from an individual who for a long time has accustomed himself to the use of this drug and has acquired a high degree of tolerance. Any acute illness or accident, which prevents the patient from obtaining his accustomed quantity of alcohol, tends to precipitate an attack of delirium tremens; so also will an attack of alcoholic gastric catarrh if it produces uncontrollable vomiting and thereby precludes the absorption of alcohol. The attack of delirium tremens supervenes after an incubation period of from two to four days following the sudden fall in the amount of alcohol in the patient's circulation.

The preventive treatment of delirium tremens consists in the 'tapering off' of alcohol in the course of a few days (as described in a later paragraph on the treatment of chronic alcoholism), and in the avoidance of sudden cutting off of the drug. Once delirium tremens has supervened, one's chief endeavours are directed towards calming the patient's excitement and procuring sleep. For these purposes he must be kept in a quiet room, with special nurses or attendants to watch him. A preliminary hot bath has an excellent sedative effect, and should be employed whenever available. Failing this, a cold pack is a good substitute, the patient being wrapped in a large sheet wrung out of cold water, and enveloped in several layers of thick blankets. He must be kept in bed, and fed with easily assimilable foods, such as hot beef-tea, milk, and strong soups. Mild cases sleep without hypnotic drugs, but in more severe ones the main indication for treatment is to induce sleep by means of some quickly-acting hypnotic in full doses. Veronal, gr. 10,

repeated several times at intervals of two hours, is often efficacious. Another useful hypnotic mixture is the following :—

℞					
	Potassii Bromidi	gr. xxx	Tincturæ Hyoscyami	℥xxx
	Chloralis Hydratis	gr. xx	Aquæ Menthæ Piperitæ	q.s. ad ℥j

Half of this dose may be repeated in a couple of hours, if the first dose is insufficient.

In cases with wild motor excitement, $\frac{1}{100}$ gr. of hyoscine hydrobromide may be administered hypodermically, and will generally calm the patient.

Mechanical restraint should be avoided as much as possible. A tactful female nurse usually succeeds in controlling the patient. She should, however, have the assistance of a strong male attendant, in case of emergencies. If the patient be violently excited and struggling to get out of bed, a good way to restrain him is by means of a folded sheet placed across his waist, between the blankets, including the patient and his bedstead, and tied firmly beneath the bed.

Alcohol should be avoided when delirium tremens has actually supervened. If the heart fail, give strychnine hypodermically. and ammonium carbonate by the mouth. Careful examination of the chest should be made from day to day, lest pneumonia or other complication should arise.

When the patient has attained convalescence, he should be placed on a tonic mixture containing nux vomica, and it is well to send him off for a holiday, in the companionship of someone who will exercise over him a judicious moral influence.

Dipsomania.—Dipsomania is a recurrent paroxysmal impulse towards violent alcoholic excess. A characteristic of the disease is that the dipsomaniac has intervals, between his paroxysms, during which not only has he no particular desire for alcohol, but he may have even a distaste for it. Dipsomania is a congenital idiosyncrasy, and is not the mere result of habitual tippling.

Before the outbreak of each bout there is a premonitory stage of restlessness and irritability, during which the patient's character and disposition change—he sleeps badly, loses his appetite, and finally, after a few days, his craving for alcohol becoming irresistible, he drinks heavily and uncontrollably. The drunken bout may last a week, or longer. It then culminates in a sort of crisis, with gastric catarrh, vomiting, and prostration. The patient comes to himself, repentant and ashamed, and starts on another quiescent period, which culminates in due course in another attack of craving.

The treatment of true dipsomania varies according to the stage at which the patient comes under care. If the attack is already established, and he is drinking hard, it can usually be cut short by giving hypodermically an emetic dose (gr. $\frac{1}{10}$) of apomorphine. This precipitates the gastric crisis, and produces acute vomiting, followed by profound sleep, generally lasting from three to eight hours. The patient wakes free from his craving. One may then administer smaller doses of apomorphine (gr. $\frac{1}{40}$ to gr. $\frac{1}{30}$) every three or four hours, hypodermically, for three or four doses, to maintain a mild hypnotic effect.

If the dipsomaniac be caught during the premonitory restless stage, when the alcoholic craving has commenced but he has not yet given way to drink, again apomorphine is of great value. An emetic dose is not necessary. All that is required is a small dose (gr. $\frac{1}{40}$ to gr. $\frac{1}{30}$) which produces faint nausea followed by several hours' sleep. When the patient wakes, this dose may be repeated.

Unfortunately we have no means of preventing the periodic recurrence of the craving, but must be content to watch for the premonitory stage and step in on each occasion with apomorphine.

During the non-drinking period treat the patient as a neuropathic subject, and by appropriate hygienic surroundings, physical, mental, and moral, maintain his general health in as high a state as possible. Hypnotic suggestion is often markedly beneficial. For successful hypnotic treatment the patient's co-operation is essential ; he must be willing to be cured. Hypnotism, of course, can be successfully applied only during the interparoxysmal period. Deep hypnosis should be aimed at, and should be repeated every week for several weeks, and thereafter at longer intervals, so as to confirm the original suggestion. Not only must relief from the alcohol craving be suggested, but also a distaste for the drug. Total abstinence is the only safe rule for such patients. (*See* HYPNOTISM.)

Chronic Alcoholism.—For a reasonable prospect of success it is essential to have the patient removed from his home surroundings and placed in entirely new environment, under skilled supervision. For this purpose he should be induced to enter a special hospital or sanatorium, or, if this be unattainable, to place himself as a boarder with some medical man who will exercise the necessary benevolent control over him. Country surroundings are always best.

In such circumstances it is advisable in a severe case to commence without delay the special treatment by means of atropine and strychnine, originally advocated by McBride. The following is an outline of this treatment, as carried out at the Norwood Sanatorium :—

On admission a careful and complete physical examination of the patient is made. Unless there be some contra-indication, a brisk initial purge is given. On the following day the patient is put on the following tonic mixture :—

℞ Liquoris Cinchonæ Concentratis ℥xxiv	Solutionis Atropinæ Sulphatis (gr. j ad ℥j) ℥j
Liquoris Gentianæ Compositæ Concentratis ℥viij	Glycerini ℥j
Solutionis Strychninæ Nitratis (gr. iv ad ℥j) ℥j	Aquam ad ℥j

This is given five times daily, at intervals of three hours. On the second day, hypodermic injections of strychnine and atropine are added, and are administered three times a day, according to the appended plan.

Both drugs, it will be observed, are pushed until their full pharmacological effects are produced. We have a solution of strychnine nitrate (4 gr. to 1 oz.) and one of atropine sulphate (1 gr. to 1 oz.). Both these drugs are administered three times a day in progressively increasing doses. The dose of strychnine solution begins at 2 min. and increases by 1 min. every other day until the maximum (7 min.) is attained. The dose of atropine solution begins at 1 min. and is increased by 1 min. every other day up to the maximum of 6 min. In an average case the routine is as follows :—

First week.—Gradual increase to 5 min. of strychnine solution, and 4 min. of atropine solution.

Second week.—Continued increase to a maximum of 7 min. of strychnine solution, and 6 min. of atropine solution.

Third week.—Continuation of maximum doses of 7 min. of strychnine solution, and 6 min. of atropine solution.

Fourth week.—Reduction to 6 min. of strychnine solution, and 5 min. of atropine solution.

Fifth week.—Further reduction to 5 min. of strychnine solution, and 4 min. of atropine solution.

Sixth week.—Progressive reduction to 2 min. of strychnine solution, and 1 min. of atropine solution.

During the first week or two of treatment, i.e., until the effects of the atropine and strychnine injections are fully established, the patient confines his walks to the grounds of the sanatorium. Afterwards he can go out freely on parole, always returning at meal-times and at the hours for injections.

Such is the routine treatment in a case of moderate severity.

As to the withdrawal of alcohol in chronic alcoholists, if this be done suddenly it is apt to produce insomnia and even delirium tremens or alcoholic epilepsy. It is therefore advisable to withdraw the alcohol gradually. In the case of a man who has been consuming, say, a bottle of whisky a day, we allow him three-quarters of a bottle the first day, two-thirds of a bottle the second day, half a bottle the third day, and on the three succeeding days 10 oz., 6 oz., and 2 oz. respectively. On the seventh day the patient gets no alcohol.

Open-air exercise without fatigue is to be recommended. Golf is particularly suitable as a pastime for such patients. A daily time-table of occupation should be laid down, and its performance insisted on.

The diet must be generous, but easily assimilable. Daily warm baths are beneficial, and the bowels must be carefully regulated. Hours of meals must be regular, and also those of sleep.

All these measures obviously necessitate an amount of supervision which is difficult of attainment save in a household specially arranged for the purpose.

Whatever be the form of treatment adopted, the aim is essentially the same : to make the patient a permanent abstainer. Any attempt on the part of a former alcoholic patient to return to the intermediate class of 'moderate' drinkers is almost certain to induce a relapse to his old excess. *James Purves Stewart.*

ALOPECIA AREATA.—Since this disease tends, in young persons at least, to spontaneous recovery, it is not always easy to say how much of the benefit which may follow a particular line of treatment is due to it. At present stimulants and antiseptics are the most popular remedies, and some favour one, some another. The writer's preference is for lactic acid, which he uses in a lotion (5 to 10 per cent) with castor oil and spirit. After that come, in his estimation, sulphur and salicylic acid, 5 per cent of each in an ounce of lard ; chrysarobin, 5 per cent in equal parts of glycerin and chloroform (this must, of course, be used with great care, on account of the violent erythema it sets up on the face) ; and corrosive spirit, $\frac{1}{2}$ to 1 per cent.

Cases occasionally recover after the application of high-frequency currents, as they do after any or sometimes without any treatment ; *x* rays seem a somewhat paradoxical method of treatment, since they cause the fall of the healthy hair ; but in the exposure to the rays of the mercury vapour lamp, Kromayer seems to have found a method of treatment of real value in cases which fail to respond to less elaborate methods.

If the patient be anæmic, or if he show any other disturbance of general health, suitable internal treatment is indicated ; but the majority of cases of alopecia areata are otherwise quite well. (*See also* HAIR, DISEASES OF.)

It is very important that the treatment be continued until the hair is growing vigorously on every one of the patches ; and it is well to bear in mind that the disease is not confined to the scalp, but attacks also the face, limbs, and trunk ; and patches of the disease, wherever situated, must be cured, otherwise 'recurrence' is almost certain. All ordinary precautions against infecting others should be taken. *Norman Walker.*

AMENORRHŒA.—Amenorrhœa may be apparent or real. Apparent amenorrhœa, or retention of menses, is due to the absence of a free exit for the menstrual discharge. This is generally due to the presence of an obstructing membrane at the vaginal orifice, but sometimes it is due to partial or complete absence of the vagina. The treatment of such cases is, if practicable, to let out the pent-up discharges and to maintain a free exit for them subsequently. In cases where the retention is caused by an obstructing membrane this is easy ; a crucial incision is made through the bulging membrane and the retained fluid allowed to drain slowly away, after which the vagina is irrigated with an antiseptic lotion and an external dressing applied. This is, of course, a surgical operation, for which an anæsthetic and strict asepsis are necessary. Where the retention is due to absence of the vagina, this form of treatment is impossible ; for a permanent passage can be maintained as such only if it is lined by mucous membrane or skin. In all cases of complete and in many cases of partial absence of the vagina, menstruation must be put a stop to by removal of the uterus, as it is impossible to provide an exit for the recurring monthly discharges.

Real amenorrhœa may be congenital or acquired. In congenital cases it may be due to the absence or imperfect development of the uterus or ovaries, or of both. No treatment is likely to be successful in such cases. Nevertheless, treatment by organic extracts should be given a fair trial, in the hope that the glandular internal secretions thus provided may stimulate the growth and development of the faulty organs. Best for this purpose are ovarian substance (dried gland) gr. 5 and thyroid gland gr. $\frac{1}{2}$, given together three times a day after food. The prognosis in these cases, not only as to menstruation, but also as to child-bearing, is extremely bad. Occasionally real congenital amenorrhœa is met with in women whose pelvic organs appear on clinical examination to be normal. Treatment by organic extracts is indicated in these cases also, but if the amenorrhœa persists up to the twenty-fifth year it is almost invariably permanent ; the prognosis as regards child-bearing is favourable.

Acquired amenorrhœa, apart from pregnancy, lactation, and the menopause, is

generally a symptom of some abnormal condition of health. In such circumstances the cause has to be sought for, and the general state of ill-health, of which the amenorrhœa is but one of the symptoms, must then be treated. Chlorosis is perhaps the most common disease to cause amenorrhœa. Rest, attention to the digestive organs, and subsequently the administration of iron—in large doses of ferrum redactum—is the plan to be adopted. In simple amenorrhœa, where there is no obvious anæmia, iron, thyroid and ovarian extracts, and calcium lactate may be tried.

Young women sometimes become rapidly fat and then often cease to menstruate. This state of affairs, often associated with sterility in married women, is supposed to be due to deficiency in the ovarian or thyroid secretions. Massage, exercises, a regulated diet, and administration of thyroid and ovarian substance should be tried.

Eardley Holland.

AMPUTATIONS.—(*See* Stumps, Treatment of.)

ANÆMIA.—This is a common accompaniment of many diseases (so-called 'secondary anæmia')—in some cases so striking a feature that it appears in itself to constitute the disease (so-called 'primary anæmia'). In either form the indications for treatment are the same, viz. :—

1. *Etiological.*—Removal, so far as possible, of the individual factors which, either singly or, as is more commonly the case, collectively, have co-operated to cause the anæmia.

2. *Remedial.*—Correction of the effects, e.g., loss of available iron, or diminished powers of blood formation, which the operation of the causes or the mere existence of the anæmia over a lengthened period of time has brought about.

The etiological distinction between secondary and primary anæmias—that while in the former the etiology is clear, in the latter it is unknown or indefinite—is, from the point of view of treatment, an artificial one. As a matter of experience, even in the latter group, indications for treatment, based on the existence of etiological factors, are not wanting, and require even more consideration than in the group of secondary anæmias, where they are so prominent that they do not need to be looked for.

Types of Anæmia.

A consideration of the etiological factors concerned in the production of anæmia shows that the treatment to be adopted may conveniently be considered in connection with three forms of anæmia representing the chief types met with :—

1. *Chlorosis.*—Often termed a primary form of anæmia, but in reality secondary—the purest form of all anæmias, owing its origin to the operation of a number of factors, slight in themselves, but of a non-infective character.

2. *Septic Anæmia.*—A form of anæmia hitherto not sufficiently recognized, but differentiated by the writer in 1900, owing its origin to the existence of sepsis in connection with the oral, gastric, and intestinal tract ; one of the commonest forms of anæmia, frequently complicating and greatly intensifying all other kinds ; sometimes so intense that in itself it constitutes one of the severest forms of anæmia—resembling in its intensity the severest of all (pernicious anæmia), and hitherto generally grouped with this form, but differing from it in its pathology, in the character of its blood changes, and in its prognosis.

3. *Pernicious Anæmia.*—Pernicious hæmolytic anæmia—a form of anæmia of infective origin of specific nature, in which sepsis is a most important antecedent and complication, but has grafted on to it an intense hæmolysis which marks it off sharply from septic anæmia ; and characterized throughout by a mode of onset, a characteristic group of clinical features, a clinical course, and a prognosis (resistance to treatment) sharply distinguishing it from septic anæmia.

CHLOROSIS.

The first point in the treatment of this condition is the recognition of the various factors, usually slight in degree, concerned in its production. These are connected :—

1. With the characters of the blood in youth, especially from fifteen to twenty-two, when this form of anæmia is most prevalent ; i.e., the blood at this period has 10 per cent

fewer corpuscles, 8 to 10 per cent less hæmoglobin, 5 per cent more water, and is smaller in quantity than at any other period of life.

2. With growth and development at the period of puberty.

3. With occupation—throwing additional strain on the body, and at the same time usually associated with more confinement, less air and light, and more physical strain, than in the period of life prior to puberty.

4. With disturbances in digestion, diminished appetite, dyspepsia, and constipation—affecting not only the general nutrition, but also in a special degree the amount of iron ingested. Whereas a normal dietary contains daily $\frac{1}{11}$ to $\frac{1}{8}$ gr. iron, the dietary of three chlorotic girls was found to contain only $\frac{1}{50}$ to $\frac{1}{20}$ gr.

5. With periodic loss of blood at this period, slight in itself, but important when combined with diminished intake of iron, and greatly aggravating the chlorosis when, instead of the natural and protective process of amenorrhœa, the opposite condition of menorrhagia is present.

To these more constant and important factors may be added the disturbances connected with psychical and mental emotions, associated in a special degree with this period of life. The effects of these are aggravated by one circumstance quite peculiar to this period of life, and to this condition, i.e., that girls consider pallor to be attractive rather than otherwise ; and in the classes in which chlorosis is most prevalent they not infrequently from pure choice adopt a dietary such as rice (the poorest of all in iron constituents), tea, and milk, and avoid or have even a repulsion to meat, the one food which contains the iron of which they stand in need.

If to these be added the factor which undoubtedly exists in certain families more than in others, i.e., the natural predisposition to pallor, we have before us a brief summary of the physiological and pathological factors which, operating together, amply suffice to explain the origin of this anæmia, and place it not only in the group of secondary anæmias, but also among the purest and most typical forms of secondary anæmia.

To the above factors of non-infective nature there may, however, be added others which are infective, notably sepsis ; originating especially in oral sepsis, and associated with gastric and intestinal sepsis ; and independently causing varying degrees, slight or severe, of septic anæmia. The combination of chlorosis, pure and simple, with this septic anæmia is, in the writer's experience, a very common one, and gives to many cases of chlorosis their severe and chronic character, and their resistance to the ordinary measures of treatment to which, in the absence of this septic anæmia, they would otherwise respond.

The measures, then, to be adopted in treating chlorosis are the following :—

1. *Digestive.*—The correction of the gastric and intestinal disturbances (dyspepsia and constipation) which are so frequently associated with the condition.

2. *Dietetic.*—The substitution of foods richer in iron for those which the patient has been taking.

3. *Medicinal.*—(*a*) The supply of additional iron in the form of preparations which experience has shown to be the least disturbing to digestion, the most assimilable, and the least constipating ; and (*b*) The use of other tonics, notably of arsenic, hypophosphites, and strychnine, which experience shows also exercise a beneficial influence, not only directly on the blood-forming powers (arsenic), but also on the nervous tone of the whole intestinal tract (phosphites and strychnine).

4. *Hygienic.*—The correction, so far as is possible, of those ways of living which place too great a physical strain upon the general bodily powers at this period of life, and deprive the patient of the air and light which are as necessary to the formation of hæmoglobin as they are to the formation of the colouring matter of plants.

5. *Climatic and Balneological.*—Measures supplementary to the foregoing in severe cases resisting the ordinary and generally successful measures of treatment.

Digestive Treatment.—It is essential in cases of chlorosis to correct any digestive disturbances, and to remove the constipation, as a first step in the treatment. As the condition is usually one of chronic dyspepsia, not infrequently of gastric catarrh, and in some cases of actual ulceration of the stomach (gastric ulcer), these can be best removed by stomachic sedatives, especially soda and bismuth preparations. The following are some of the preparations with combinations which will be found useful for this purpose :—

STOMACHICS.

℞ Sodii Bicarbonatis	gr. xv	Spiritus Chloroformi	℥xx
Spiritus Ammoniæ Aromatici	℥xxx	Infusi Caryophylli	q.s. ad ℥j

To be taken three times a day before meals.

℞ Sodii Bicarbonatis	gr. xv	Tincturæ Cardamomi Co.	℥xxx
Ammonii Carbonatis	gr. v	Aquæ Menthæ Piperitæ	q.s. ad ℥j
Succi Taraxaci	℥j		

To be taken three times a day before meals.

℞ Magnesii Carbonatis	gr. vij	Syrupi Zingiberis	℥xxx
Ammonii Carbonatis	gr. iij	Aquæ Menthæ Piperitæ	q.s. ad ℥j
Tincturæ Lavandulæ Co.	℥xxx		

To be taken three times a day before meals.

℞ Bismuthi Subcarbonatis		Pulveris Tragacanthæ Co.	āā gr. x
Sodii Bicarbonatis		Aquæ Menthæ Piperitæ	q.s. ad ℥j

To be taken three times a day before meals.

℞ Bismuthi Subcarbonatis	gr. x	Acidi Hydrocyanici Diluti	℥iv
Magnesii Carbonatis	gr. xv	Aquæ Menthæ Piperitæ	q.s. ad ℥j

℞ Potassii Bicarbonatis		Tincturæ Rhei	℥viiss
Sodii Bicarbonatis	āā gr. xv	Infusi Calumbæ	q.s. ad ℥j
Spiritus Ammoniæ Aromatici	℥xv		

To be taken twenty minutes before meals.

℞ Sodii Bicarbonatis	gr. xv	Tincturæ Sennæ Co.	℥xv–xxx
Spiritus Ammoniæ Aromatici	℥x	Infusi Gentianæ Co.	q.s. ad ℥j

To be taken five minutes before meals.

℞ Tincturæ Nucis Vomicæ	℥v	Spiritus Chloroformi	℥x
Tincturæ Sennæ Co.	℥xv–xxx	Infusi Quassiæ	q.s. ad ℥j
Ammonii Carbonatis	gr. iij		

To be taken five minutes before meals.

Constipation should be corrected by suitable aperients, and these can often be effectively combined with the iron which we also desire to administer—as in the following preparations :—

APERIENT IRON COMBINATIONS.

℞ Ferri Sulphatis	gr. iv	Tincturæ Zingiberis	℥xx
Magnesii Sulphatis	℥j	Infusi Gentianæ Co.	q.s. ad ℥j
Acidi Sulphurici Aromatici	℥x		

Twice daily, at 11 a.m. and 6 p.m. (*Sir A. Clark.*)

℞ Ferri Sulphatis	gr. iv	Tincturæ Zingiberis	℥xx
Sodii Bicarbonatis	gr. xx	Spiritus Chloroformi	℥x
Sodii Sulphatis	℥j	Infusi Quassiæ	q.s. ad ℥j

At 11 a.m. and 6 p.m.

℞ Magnesii Sulphatis	gr. lx	Aquæ Chloroformi	q.s. ad ℥j
Liquoris Ferri Perchloridi	℥xv		

Every morning.

℞ Pil. Aloes et Ferri gr. iv–viij

At night.

℞ Aloini	gr. ½–j	Ferri Sulphatis	gr. j
Ext. Belladonnæ Viridis	gr. ¼	Extracti Gentianæ	q.s.
Extracti Nucis Vomicæ	gr. ⅛		

To be taken at night.

Even when digestive intestinal disturbances appear to be absent, it is always well to commence the treatment of chlorosis by measures directed especially towards this tract. Unless this is done, it will often be found that the iron which we desire to administer disagrees, and its administration has to be stopped until the stomach and intestine have been restored to a healthier condition by the use of the foregoing preparations.

Dietetic Treatment.—The appetite is in many cases so poor that the diet indicated is one often described as light and easily assimilable. It is usually held to include more especially such articles as milk, soups, and farinaceous foods in the form of milk puddings, with fish and chicken. It will be seen, however, from the following table that this class of food does not contain the amount of iron of which this condition stands in special need. This is particularly true of farinaceous food, especially of rice, which is actually the poorest in iron, and the one most frequently used (if not actually abused, if, as is stated, some of the domestic class, in which chlorosis is notoriously most prevalent, make a practice of eating dry rice for the very purpose of producing a pale complexion).

The chief point as regards diet is the necessity of increasing the amount of meat, which contains two to eight times more iron than is present in such an article as rice; three or four times the amount contained in flour; twice or thrice the amount contained in potatoes; two to seven times more than the amount contained in milk. The following table gives the percentage of iron in the various classes of food most commonly in use* :—

List of Foods with their Iron Contents (*Bunge*).

100 Grms. of	Mgrms. of Iron	100 Grms of	Mgrms. of Iron
Rice contains	1·8	Strawberries	8·9
Rye	4·9	Cabbage	3·9
Wheat	5·3	Spinach	35·9
Oats	13·1	Cows' milk	2·3
Corn	3·6	Human milk	2·7
Potatoes	2·0 to 6·4	Beef	4·8 to 16·6
Peas	6·6	Eggs	5·7
Beans	7·4 to 8·3	Fish	1·5 to 84·2
Lentils	8·3 to 9·5	Veal	2·7
Apples	13·2		

Food.—The diet in anæmia should, therefore, to a considerable extent, consist of animal food—preferably underdone—and in severe cases, especially in children, great advantage can be obtained by the administration in the raw form, pounded up, and given either alone or with various meat extracts to mask its appearance and taste.

Patients should be encouraged to take—in however small a quantity—chopped or scraped beef, mutton, chicken, eggs, bread and butter, milk; amongst vegetables, lettuce; amongst fruits, oranges, stewed apples, and prunes. Pastries, for which chlorotics often have special relish, are harmful in most cases, and should be avoided.

The chief difficulty with most anæmic patients is the loss of appetite and the enfeebled digestion. The best treatment for this is to send the patients to bed. With rest in bed, even a feeble digestion can supply the wants of the body, with a little to spare for improvement. So long as they continue to go about and do their work, such patients make no progress, whatever the character of the food or however much iron they take. Digestion may be assisted by the administration of hydrochloric acid and pepsin, or malt, with each meal. Food should be taken in smaller amounts and at intervals of four hours. Liquids should be taken sparingly, especially with food.

Medicinal Treatment.—The most important measure is the administration of iron, continued for eight to ten weeks at least; then intermitted for two or three weeks, and afterwards taken in smaller quantity, and continued for several months. The object to be aimed at is not merely to restore the blood to its normal percentage of hæmoglobin, but to afford time for the body to lay up some reserve of iron in its blood-forming tissues.

The particular form of iron preparation is immaterial, provided only that it does not disturb the digestion, and that it agrees with the patient. The inorganic preparations in ordinary use are perfectly efficient, and give the best results. The choice of the particular preparation is guided largely by the condition of digestion and of the stomach.

Reduced iron, ferrous carbonate of iron in one form or other, or one of the scale preparations, e.g., citrate of iron and ammonia, is the least irritant; protochlorides and sulphates are distinctly more irritating, and the ferric salts still more so.

Reduced iron is tasteless, but repellent in appearance, and is apt to cause unpleasant eructations. It may be given in 2- to 5-gr. doses, in rice, capsule, or chocolate form, or

* Bunge here refers to 100 grammes of *dry* substance; not as they appear as food.—Ed.

in form of a powder to be taken between two slices of bread. *Perchloride of iron* gives very good results in anæmia from convalescence, but is apt to cause disturbance of digestion. *Citrate of iron and ammonia* gives good results, especially when it is necessary to continue iron for a long time. It is especially suitable for children on account of its pleasant taste. The best results are, however, got with *ferrous carbonate*, especially when freshly prepared, as in its well-known combination of ferrous sulphate with potassium carbonate, in Blaud's pill, or pil. ferri (B.P.), or ferri carbonas saccharatus (3 to 5 gr.)—a good chalybeate very free from astringency—also contained in mistura ferri composita (B.P.). In many cases the iron may, with advantage, be administered along with laxatives, such as aloes or saline cathartics, as in some of the combinations already given.

The following are some of the combinations which have been found most useful :—

Arsenic is a valuable blood tonic in many cases of anæmia, either alone or in the form of liquor arsenicalis (3 to 5 min.), or in combination with iron, either as arsenious acid in doses of $\frac{1}{50}$ gr., or as arseniate of soda.

BLOOD TONICS.

℞	Liquoris Arsenicalis	℥iij	Tincturæ Cardamomi Co.	℥xxx
	Syrupi	℥xxx	Aquæ	q.s. ad ℨj

IRON TONICS.

℞	Tincturæ Ferri Perchloridi	℥xv	Spiritus Chloroformi	℥xv
	Acidi Phosphorici Diluti	℥x	Infusi Quassiæ	q.s. ad ℨj

Three times a day after meals.

℞	Ferri et Ammonii Citratis	gr. v	Aquæ	ℨj
	Acidi Citrici	gr. x		

To be taken with sodium bicarb. gr. x in state of effervescence three times a day.

℞	Tincturæ Ferri Perchloridi	℥v	Tincturæ Cardamomi Co.	℥xxx
	Glycerini	℥xxx	Aquæ	q.s. ad ℨj

Three times a day after meals.

℞	Ferri et Ammonii Citratis	gr. v	Glycerini	ℨj
	Spiritus Ammoniæ Aromatici	℥xxx	Infusi Calumbæ	q.s. ad ℨj

To be taken three times a day after meals.

℞	Tincturæ Ferri Acetatis	℥x	Liquoris Ammonii Acetatis	ℨij
	Acidi Acetici Diluti	ℨss	Aquæ	q.s. ad ℨj

Red corpuscles contain proteid matter, fat, iron, and potash.

℞ Pil. Ferri (sulphate of iron and carbonate of potash).
Is very satisfactory.

℞ Mist. Ferri Co. (carbonate of potash and iron sulphate).
Exceedingly good.

℞	Liquoris Ferri Perchloridi	℥xv	Infusi Quassiæ	ad ℨj

℞	Ferri Sulphatis	gr. iv	Tincturæ Zingiberis	℥xx
	Sodii Bicarbonatis	gr. xx	Spiritus Chloroformi	℥x
	Sodii Sulphatis	ℨj	Infusi Quassiæ	q.s. ad ℨj

Twice a day. (*Sir A. Clark.*)

℞	Tincturæ Ferri Perchloridi	℥x	Glycerini	℥xx
	Liquoris Arsenicalis	℥ij	Aquæ	q.s. ad ℨj

Three times a day in a wineglass of water after food.

Iron Waters are useful in various forms of anæmia, especially in those due to acute illness or actual loss of blood, also in cases of long-standing chlorosis.

The waters to be preferred are those containing bicarbonate of iron with free carbonic acid. In cases where there is dyspepsia, with intestinal catarrh or a tendency to hepatic disorder, their use is better preceded or accompanied by that of muriated or sulphated alkaline waters, or of aperient drugs. They are contra-indicated in feverish conditions, and in severe disturbances of the digestive organs.

With regard to such chalybeate springs, the best known are those of Spa in Belgium, Schwalbach, and St. Moritz. Spa waters contain a considerable amount of bicarbonate of iron and a large amount of free carbonic acid. The latter makes them pleasant to most people. Schwalbach waters are strong, fairly pure chalybeate, containing an excess of free carbonic acid with scarcely a trace of sulphuretted hydrogen. At St. Moritz, Switzerland, also, the springs are chalybeate, rich in carbonic acid, and very pleasant to the taste. Compared with those of Schwalbach they are relatively poor in iron, but owing to the climatic conditions they are in many cases more effective than stronger springs at lower situations. On the other hand, the high altitude (5800 ft.) is not suitable for nervous or excitable patients, and is distinctly disadvantageous, according to the writer's experience, in severe cases of any form of anæmia, especially chlorosis. The worst case of chlorosis he has seen—the only one which ever gave him immediate cause for anxiety—he found at a high altitude in Switzerland. The rarefied atmosphere, combined with the great deficiency in hæmoglobin, caused dyspnœic distress such as he had never seen in any chlorotic patient. This distress had begun and been attended by fainting attacks half an hour from the time when the patient began to ascend from the level of the valley (1000 ft. altitude) to the four or five thousand feet at which she was found.

Of English chalybeate springs, Tunbridge Wells is one of the oldest (1606) and best known. The waters do not contain free carbonic acid. Cheltenham and Melksham have muriated, sulphated waters. The tonic effect of such waters is greatly aided by the use of the chalybeate baths. These act chiefly by virtue of the large amount of carbonic acid present and the stimulating tonic effect which the bubbles of this gas exert on the nerve-endings of the skin.

Balneological.—The benefit derived from courses of such waters is greatly enhanced by—if not largely due to—the change of scene, the enforced rest, the stricter dietetic régime, the stimulating and tonic effects of baths—especially those saturated with free carbonic acid, as at Schwalbach and Homburg—which many of the foreign spas provide.

The foregoing general principles for the treatment of chlorosis are applicable to all cases of non-infective anæmia. The principles applicable to the treatment of 'infective anæmias' are of a different and more directly etiological and preventive character.

SEPTIC ANÆMIA.

The form of anæmia to which the writer has given the above title is, according to his observations, at once one of the commonest and one of the least recognized types. It frequently complicates other forms of anæmia, e.g., chlorosis, malignant disease, Bright's disease, pernicious hæmolytic anæmia, leukæmia, the intestinal infective anæmias of children, purpura, etc., giving them an intensity out of proportion to their ostensible cause. In certain cases it is so severe that it can occasion an anæmia resembling in degree, and hitherto mistaken for, pernicious (hæmolytic) anæmia, but differing from the latter in essential pathological respects, most notably in the absence of the hæmolysis and of the tongue (glossitic) changes which, as shown by the writer (1900), characterize pernicious anæmia. In some cases the septic absorption is connected with leucorrhœal discharges, but in the great majority the septic lesions are in the alimentary tract.

In many cases the trouble is connected with chronic suppurative lesions in the nasal sinuses. The maxillary antrum is the sinus most often affected, less commonly the ethmoidal and frontal sinuses, and rarest of all the sphenoidal sinuses. It frequently happens that more than one of these cavities are discharging simultaneously, several drachms of fœtid pus being secreted and swallowed daily for many years. The patient becomes so accustomed to this discharge that in most cases he makes no mention of it—he has always had it, and does not connect it with the general loss of strength and ill-health which have gradually developed.

Still more commonly the seat of septic trouble is the mouth itself—the existence of 'oral sepsis', manifested by septic infection in connection with decayed roots, tartar, gold crowns, gold caps, bridges, etc., pyorrhœa alveolaris, and septic lesions of gums connected with these conditions.

The important point to be noted is that the degree of anæmia is often so marked that

none of the usual evidences (redness and pain) of inflammation are present, and lesions of an intensely septic character are on this account frequently overlooked.

Treatment.—The prime indication is the discovery and removal of the sepsis underlying the condition. The oral antiseptic treatment to be employed includes not merely the use of mouth-washes (these exercise a very superficial effect on the oral sepsis present in such cases), but the more direct treatment of the septic lesions around each affected root. In many slighter cases this can be done most effectively by swabbing the affected roots and gums, after the removal of any tartar present, with 1–40 carbolic lotion, and in cases of oral sepsis this measure should never be omitted, even in those which subsequently require the services of the dentist. Wherever possible, diseased roots should be removed, particular care being taken, by careful antiseptic precautions both *prior* and subsequent to the operation, to prevent any subsequent complications.

In most cases the effects of the long-existing oral sepsis have extended to the stomach and intestines, and have created unhealthy conditions of the mucosa ('septic gastritis' and 'septic enteritis'), which require to be dealt with by appropriate gastric and intestinal sedatives, laxatives, and tonics. The most useful drugs are those with disinfectant properties, especially bismuth salicylate (10 to 15 gr. thrice daily before food), perchloride of mercury (30-min. to 1-drachm doses of the liquor), salicylic acid, or salol. The response to such measures is immediate—*after the removal of the sepsis of the mouth.*

After removal of the sepsis, recovery from the anæmia can be promoted by the usual hæmatinic drugs—iron and arsenic, or hypophosphites—and by the other dietetic, medicinal, and hygienic measures applicable to all forms of anæmia. But it is astonishing how very little such drugs are required, and how rapid is the recovery after the sepsis is effectually removed in such cases.

PERNICIOUS ANÆMIA.

General Considerations.—The treatment of this severe disease is greatly influenced by the view taken of its pathology. Next to the profound degree of the anæmia, the two most prominent features presented by the blood are: (1) The extraordinarily severe and pernicious character of the blood destruction—hæmolysis; (2) The no less striking powers of recovery. Both these features are more marked than in any other form of anæmia. It is not uncommon to find a patient's blood reduced from the normal standard of 90 or 100 per cent to 20 or 30 per cent in the course of a few weeks, accompanied by all the clinical evidences of intense blood destruction, viz., high colour of urine, urobilinuria, lemon colour, biliousness, and occasionally jaundice. No less striking is the rapid recovery of the blood when the hæmolysis is arrested. The percentage of corpuscles and hæmoglobin often rises from 20 or 30 per cent up to 80 or 90 per cent within a month or two, in some cases in the course of three to four weeks.

This remarkable power of recovery is a natural feature of the disease, and its most hopeful one. From the point of view of treatment, however, it is often misleading, since the particular treatment in use at the time of its occurrence is wrongly credited with having produced it—with having cured the disease. It misleads, moreover, in another way, with unfortunate results. For so remarkable is the recovery, that doubt is cast, both by the doctor and the patient, on the accuracy of the original diagnosis. The patient feels and looks so well that he resumes his ordinary occupations and habits of life, and gives up all treatment. There follows, in a period varying from six to nine months, the usual relapse, fatal in a number of the cases. In a certain number, however, recovery again takes place, although more slowly, and less complete in character; the patient remains well for another period of three to six months, when a second relapse occurs. In the writer's experience of over 200 cases, the prognosis of the disease has been most materially improved by the antiseptic treatment which he is in the habit of carrying out. The immediate recovery is often most remarkable; the intervals between relapses are longer; the health between the relapses is often quite normal; and the recovery may now extend to over ten to fifteen years or longer, instead of a year or two, as was formerly the case.

General Management and Diet.—

During acute attacks.—The symptoms in severe cases are those of an extremely severe acute febrile disease, added to those of severest anæmia. The characteristic symptoms

are the fever, often reaching 102°, 103°, or even 104° F., sickness, vomiting, or diarrhœa, very severe general disturbance, headache, drowsiness, sometimes semi-unconsciousness. These are accompanied by a marked lemon-colour—almost jaundiced—appearance.

When these severer symptoms subside they continue in a milder and modified form, sometimes for two or three months at a stretch; varying slightly at intervals of two to three weeks, and accompanied by a slight irregular fever, ranging from subnormal in the morning to 99° or 100° F. in the evening.

During this period the general treatment to be adopted should be that for a case of typhoid fever. The patient should be strictly confined to bed, and fed at intervals of every four hours with food in small quantity. The basis of such food should be milk—either alone, or peptonized, or half-peptonized—milk puddings, junket with cream, beef-tea or various forms of meat juices, bread and milk, tea and milk or coffee and milk, raw beef juice, pounded chicken or meat, and bone-marrow when tolerated. Experience shows that no absolute rules of diet can be laid down suitable for all cases. Individual patients display the most variable likes and dislikes for particular foods; and show, moreover, a most remarkable tolerance for foods which would appear unsuitable. One of the chief objects in treatment is to ascertain for each patient the particular diet which he can tolerate with the least gastric discomfort.

Such discomfort, often marked by retching and sickness, forms one of the most distressing features of the disease. The sickness usually occurs in the early morning—on awaking—and before food is taken. In severe cases, in the later stages of the disease, it may occur at any time, and often does so two or three times a day over many weeks. It is entirely independent of the character of the food or medicine given.

This fact is an important one; for the sickness is often referred quite erroneously, both by patient and doctor, to the food or medicine, and this leads to unnecessary changes. The sickness is due, partly to infective inflammatory lesions of the mucosa of the stomach which tend of themselves to heal up after a time, and partly to toxæmic influences.

The gastric symptoms may best be relieved by an occasional mustard-leaf or poultice over the stomach, and by administration by the mouth of sedatives—especially bismuth—with soda, or hydrocyanic acid, or nepenthe. When very severe, all food given should be peptonized.

The toxæmic character of this vomiting is best evidenced by the remarkably sudden way it subsides when the acute character of the disease passes off, as it often characteristically does, with great suddenness. The patient, who has been lying at the point of death, œdematous all over, delirious, vomiting nearly everything he takes, suddenly takes a turn for the better—gets a 'crisis'. He wakes up conscious, calls for food and drink, takes everything without discomfort, and makes a rapid recovery.

Medicinal Treatment.—All tonics—hypophosphites, malt, strychnine—capable of affecting the blood beneficially, may from time to time be found of use in the treatment of this anæmia in suitable cases. The only one, however, which has any special effect is *arsenic*. Its use is attended in most cases—for a time at least—with marked benefit. Until recently, when the antiseptic and antitoxic treatment presently to be described was introduced, it has been almost the only remedy capable of producing benefit in any considerable proportion of cases. It is best given in the form of Fowler's solution (liquor arsenicalis) in doses of two to three minims thrice daily after food. It may also be given subcutaneously in the form of arsenate of iron (Martindale), or in the form of arsenical waters.

Many observers recommend that the larger the dose, and the more rapidly it is pushed, the better. The writer does not share this view. On the contrary, it is his experience that cases which respond to arsenic do equally well with smaller doses. Large doses have this great disadvantage, that they induce an intolerance of the drug; and this militates greatly against its use in the subsequent relapses which invariably occur. The object to be aimed at is, then, to keep the patient on small doses of arsenic (2 to 5 min.) as long as improvement continues; to continue the arsenic in 2- to 3-min. doses for periods of months subsequent to apparent recovery. By careful regulation of dose in this way, the writer has found it possible, with occasional intermissions, to keep a patient on arsenic for a period of several years without the slightest disturbance. The arsenic may

be given in other forms—e.g., subcutaneously or as salvarsan—but in the writer's experience these offer no advantages over that given by the mouth.

Bone-marrow.—The other remedy from which benefit may from time to time be got is ox-bone marrow, administered either fresh on toast, or in the form of tabloids. First introduced by Sir T. Fraser, of Edinburgh, it has been found useful by various observers, who speak strongly in its favour and recommend that it should be persevered in and its administration pushed to a much greater extent than has hitherto been done. In many cases it cannot be tolerated.

Antiseptic Treatment.—This treatment, first introduced by the writer in 1890, aims at :—

1. The complete removal by local antiseptic measures in the case of the mouth, and by use of internal antiseptics in the case of the stomach and intestine, of the oral, gastric, and intestinal sepsis associated with the disease.

2. Special local antiseptic treatment of the infective glossitis present, supplemented by measures for raising the antitoxic power of the blood by a serum treatment.

The line of treatment based on the above considerations is, then, the following, in their order of importance :—(1) *Oral, Gastric, and Intestinal Antisepsis*, supplemented by (2) *Antistreptococcic Serum Treatment.*

1. Antisepsis.—The result of the writer's observations has been to locate the specific hæmolytic infection underlying the disease definitely to the tongue, stomach, and intestine, and to trace its source to drain infection. The contraction of this infection is favoured and facilitated by long-standing oral and gastric sepsis.

a. Oral Antisepsis.—It is chiefly important in all cases of *commencing* anæmia to direct special attention to the removal of any sepsis, *however slight*, connected with the tongue, diseased teeth, or gums. Far more than ordinary care should be taken with regard to the condition of the teeth, not only by direct local antiseptic measures, but also, whenever practicable, by the removal of old stumps, black teeth, or teeth showing commencing carionecrosis. These precautionary measures are necessary, irrespective of any statements made by the patient as to the degree of discomfort such roots and bad teeth are causing, or of the absence of any inflammation around them. As a matter of fact, indeed, however severe the degree of oral sepsis may be, it is rare to have attention drawn by the patient to his mouth, or to have any complaint made by him.

Discomfort and pain in the teeth are the result of local inflammatory reaction—periostitis and gingivitis. They indicate relatively healthy conditions, inasmuch as they denote that the local tissues still have the power to react more or less actively to septic infection. There is a stage, however, in severe anæmic conditions, as indeed in other forms of infections, when local reaction is absent, or at least insignificant, at the very time when the general septic effects are most marked. (*See* Septic Anæmia.)

b. Gastric Antisepsis.—The chief seat of the infection is in most cases the stomach, and the first effect of the infection is an infective catarrh, followed later by deeper-seated changes of the nature of glandular atrophy, and gastritis, evidenced by intermittent vomiting of inflammatory streptococcal exudation.

The indications here are to remove or combat this catarrh, either by *washing out the stomach*, suggested on the view that many of the symptoms of the disease were due to abnormal fermentation of food products within the stomach, or still better, by *administering local antiseptics* to diminish or destroy the infection underlying the catarrh.

Later observations have demonstrated the intensely infective (streptococcal) nature of the catarrh, and the progressive character of the gastric changes which it produces.

In all cases the use of local gastric antiseptics should be steadily persisted in. The one that has proved successful in certain cases against ordinary infective gastritis has been salicylic acid. This drug was selected on general grounds as the antiseptic which appeared to be at once the most powerful and the least harmful, and the result was eminently satisfactory. Improvement was noticeable at once, and salivation and sickness ceased from about the fourth or fifth day, with remarkable resulting improvement in the blood condition in two weeks' time. Other observers have since reported favourable results with this drug.

Other useful antiseptics are the various bismuth preparations (especially bismuth salicylate), perchloride of mercury, charcoal, carbolic acid.

c. Intestinal Antisepsis.—In one group of cases the intestinal symptoms predominate, or occur from time to time. In this group the best disinfectants are perchloride of mercury, calomel, or small doses of grey powder or blue pill.

2. Serum Treatment.—It is obvious, however, that if once the infection gets firmly rooted in the mucosa, mere local antiseptic treatment—however much it may benefit by diminishing or removing catarrh, and thus arresting the disease temporarily—may fail to arrest it permanently, even when aided, as when possible it ought to be, by the use of arsenic and by dietetic measures; and experience proves only too fully that such is the case. The only indication for treatment, then, is to combat the action of the poison on the blood after its absorption. The writer has therefore given a sustained and systematic trial to a serum treatment based on the results above stated.

Antistreptococcic serum was selected, inasmuch as observations point to streptococcal organisms as always being concerned in the infection. Its use is based, not on any hypothetical considerations as to the nature of the anæmia, but on the series of observations which step by step served to trace the anæmia back to an infection arising in connection with the alimentary canal.

The first case treated on the lines then recommended, viz., oral and intestinal antisepsis combined with antistreptococcic serum, was that recorded by Dr. William Elder, of Leith (April, 1900). The case was a severe one of pernicious anæmia. The treatment was oral and intestinal antisepsis, with injection of antistreptococcic serum. None of the usual remedies for anæmia were given. The result was that in forty-five days after the commencement of the treatment, the blood condition rose from 18 per cent of corpuscles with 24 per cent of hæmoglobin to 96 per cent of corpuscles and 104 per cent of hæmoglobin. A month later "he reported himself as feeling fit and well, and looked in very good health". In all, no fewer than eighteen injections were given in the course of six weeks, without any ill-effects, either local or general.

The first systematic trial made of this treatment by the writer was in a case (1900) which was very typical in its mode of onset, the character of its gastric symptoms, its urinary changes, its nervous symptoms, and its oral symptoms, and it was in a comparatively early stage.

The blood condition was 30 per cent of corpuscles and 35 per cent of hæmoglobin. The treatment was milk diet, oral and intestinal antisepsis, ammonium carbonate and tincture of digitalis as a cardiac tonic, and injection of antistreptococcic serum.

In all, four injections of the latter were given—viz., 10 c.c. on the 9th and 13th July, 1900, followed later by two injections of 5 c.c. Before treatment was commenced (July 7, 1900) the blood condition had further deteriorated, the red corpuscles being reduced to 27 per cent.

Between July 9, when he got the first injection, and August 1 (i.e., three weeks), the corpuscles had risen from 27 per cent to 65 per cent, and the hæmoglobin from 35 per cent to 75 per cent; and one notable feature of the blood at this time was the marked leucocytosis—leucocytes 17,000 per c.mm. (instead of the normal 5000 to 7000). He received a fourth and last injection (5 c.c.) on August 1.

The patient continued to improve for the next ten days, although his actual blood condition showed some relapse; and he then went to the country (Aug. 16). The treatment was as before—namely, strict oral and intestinal antisepsis, with, in addition, 1 oz. of the syrup of the hypophosphites thrice daily as a tonic. Arsenic was still withheld. He returned in six weeks' time (Sept. 26) greatly improved in looks; and his blood showed red corpuscles 3,200,000 (64 per cent), and hæmoglobin 80 per cent.

He was now given liquor arsenicalis in 3-min. doses thrice daily, increased to 5 min. three weeks later. The result was that when he reported himself on Nov. 8, 1900, his blood showed: red corpuscles 4,040,000 (80 per cent), hæmoglobin 90 per cent, and leucocytes 7500 per c.mm.; his weight was 11 st. 3 lb. (157 lb.), an increase from the time he came under observation of nearly 2 st. (24 lb.); and his gastric and intestinal functions were in all respects normal. He still retained the feeling of numbness in his fingers, although this had recently greatly lessened.

He was kept under continuous observation and strictest antiseptic treatment the whole time. For the last seven years he has remained to all appearances a stout healthy man: but severe relapses in the blood have from time to time occurred. Even these have now ceased; and his blood has remained at 100 per cent of corpuscles and 120 per cent of hæmoglobin—weight 12 st. 7 lb. When last seen, in July, 1914, he had continued in good health after fourteen years.

In this case the diagnosis was made and the treatment begun early in the course of the disease, two years after the first onset of the anæmic symptoms, but within a few months of the first serious breakdown. In other words, the patient was seen before the recuperative powers of the blood had been exhausted time after time by repeated exacerbations of the disease. This is one of the cases which the writer has been able to treat from the earliest stages onwards, since his usual experience is to see such patients only in the later stages of their illness, after their first or second relapse. In a recent case similarly treated the effect of serum treatment was even more striking. The blood, which had remained about 20 per cent for over two months, rose to over 60 per cent in

the course of *seven days*, and to 80 per cent in three weeks; the opsonic power against *Streptococcus longus* rising from 0·65 to 0·85. The patient went out, apparently a healthy woman, in three weeks' time.

In certain cases the serum caused a distinct general reaction, lasting usually for forty-eight or sixty-four hours. Whether its presence was connected with the character of the disease, or of the special serum used, it is impossible to state. But in view of its possible occurrence, it is, I consider, advisable to begin with small doses (5 c.c.).

As has been said, the object of the serum treatment is not to replace the line of treatment by arsenic as hitherto employed—and up to a certain point successfully—nor is it to replace the new line of treatment by combined oral and intestinal antisepsis which the writer has recommended. *A far greater importance is to be attached to the latter than to arsenical treatment, inasmuch as it aims at the removal of the combined infections—hæmolytic and septic—which underlie the disease.*

It is certain that the disease cannot be permanently checked by the use of arsenic alone. But that may possibly be due to the fact that up till now—the infective nature of the disease and the importance of sepsis not having been recognized—the infective lesions have been left undisturbed, and hence the patient, cured once by arsenic, has remained continuously exposed to fresh outbreaks of his infective trouble.

The prime object of the combined oral and intestinal antiseptic treatment is to remove infective lesions and septic conditions which favour their persistence. If this succeeds, there may be no necessity for further treatment other than by arsenic.

If both together fail to arrest the disease, the serum treatment is the one which appears to hold out most prospect of benefit, and the cases recorded certainly denote that it has markedly therapeutic properties.

Transfusion of Blood.—This measure, tried in the earlier history of the disease, has of recent years been again revived and put into use. The most detailed study of its effects has come from a Swedish observer—Hannsen, of Christiania. He used it in 16 cases, making in all 52 transfusions. The hope that the prognosis would be rendered better has not been fulfilled. There is not an instance in the literature, he concludes, in which a case has been cured by blood transfusion, but of his 16 cases, 15 have died and only 1 case was perhaps cured, but only after injection of salvarsan. In no single case did a well-developed 'crisis' occur; and yet in the present writer's experience, such crises occur after the antiseptic treatment above described. In 2 cases the transfusion was followed by hæmoglobinuria. In 6 cases the transfusion had no effect on the course of the disease; 2 of these cases were twice transfused, the remainder once. In one case seven transfusions were carried out in the course of three and a half months, with apparent benefit, till the patient went out, had a relapse, and died a few months later. In another case three transfusions were without any effect. In another case the transfusion was followed by hæmoglobinuria, and by a distinct set-back. In another case, after two transfusions, which also produced hæmoglobinuria, improvement followed, but was only short-lived; the patient died about a year later.

Summing up, it appears that transfusion has some slight power in improving the blood, but in this respect it falls far below arsenic.

Splenectomy has been carried out in pernicious anæmia, but without any success.

William Hunter.

ANÆMIA, SPLENIC—(*See* SPLENIC ANÆMIA.)

ANÆMIA, TROPICAL.

Climatic.—Minor degrees of anæmia are common, especially in women and children, and are to a great extent due to the sedentary life rendered necessary by the avoidance of sun and consequent restrictions on open-air life. Moderate and regular exercise, at suitable times and always short of fatigue, is the best remedy. Iron alone is useless; arsenic is of more value. Any definite cause must be treated. Constipation must be dealt with.

Secondary.—Malaria, sprue, kala-azar, trypanosomiasis, and many other acute and chronic diseases lead to a secondary anæmia. Removal of the primary cause is essential; arsenic, after the causes (malarial, etc.) are treated, is of more value than iron, but the combination of the two is often beneficial. Intramuscular injections of arseniate of iron

are often of great value. Solutions, such as Squire's liquor ferri arsenatis solubilis, in 10- to 20-min. doses, containing 2·5 per cent of the salt, may be given every alternate day.

Ankylostomes are the cause of a most severe form of anæmia. They are common in the natives, less so amongst Europeans. Removal of the worms is essential. Large doses of anthelmintics are necessary. Oil of male fern is sometimes used, but more often thymol. The patient should be kept on a low diet for the previous day, and a brisk saline aperient given. Thymol, 10, 15, 20, or even 30 gr., should be given in cachet or capsules at daybreak after fasting for twelve hours, and the dose repeated twice at intervals of one hour, and followed by a full dose of oleum ricini, or, better, by a saline aperient, as the oil may dissolve the thymol. The stools, when strained, will reveal the presence of the worms. Occasionally symptoms of cerebral disturbance or syncope follow the administration of thymol. This is more often the case if alcohol or oils in any form are taken shortly before or after, as then the absorption of thymol is much increased on account of the solubility of thymol in alcohol or oil.

An efficient substitute for thymol is eucalyptus oil and chloroform, given in castor oil (oleum eucalypti 30–35 min., chloroform 40–45 min., oleum ricini 10 drachms)—eucalyptol in the same doses is used by many. This should be divided into two doses, and should be given the first thing in the morning, after the same preliminary treatment as with thymol, with an hour's interval between the doses. Frequently the treatment has to be repeated several times, as some worms still remain. β-naphthol, in 15-gr. doses three times repeated at intervals of one hour, is also effective.

Oil of chenopodium has recently been favourably reported on as being more efficacious than thymol, less unpleasant, and more free from risk. The maximum dose is 34 min., followed in three hours' time by sulphate of magnesium ½ to 1 oz.

The proof of complete expulsion of the worms is the absence of ova from the stools two or three weeks after the treatment. If ova are still found, the treatment must be repeated. After the complete expulsion, beyond a generous diet with careful attention to the digestive functions, little is required. Iron is useful in the later stages of recovery, but is not advisable at first.

C. W. Daniels.

ANÆSTHETICS, ADMINISTRATION OF.

I.—PREPARATION AND EXAMINATION OF THE PATIENT.

Preparation.—Whenever preparation of the patient is possible, it should be arranged that no solid food should have been taken for at least four hours, and that the bowels should have been emptied by a suitable purgative, followed when necessary by a simple enema. This is not possible in some emergency cases; and in giving an anæsthetic to a patient who has not been prepared, it is important that a careful watch should be kept for the first signs of vomiting, the head turned to the side, and special care taken that the vomit is cleared out of the mouth, so that none may be sucked back into the respiratory passages.

For the administration of nitrous oxide no strict preparation is necessary; but a better anæsthesia will be obtained if no food has been taken for two hours, and the bladder should be empty.

When a patient in a feeble condition is about to undergo a serious operation, a hypodermic injection of strychnine (gr. $\frac{1}{30}$) may be given—though it is better to give small doses during the previous day or two—or a rectal injection containing half an ounce of brandy. Before any administration of ether an injection of atropine (gr. $\frac{1}{100}$) should be given, to diminish the secretion of mucus.

Examination.—In examining a patient before the administration we must not be surprised to find the pulse very rapid, as this is often produced by dread of the proceedings. A systolic murmur at the apex is not of great importance, provided there are no symptoms of want of compensation, such as breathlessness, or signs of back-pressure, as œdema in the feet, and moist sounds at the bases of the lungs. In these patients much care will be required in the choice and administration of the anæsthetic, and no closed inhaler should be used.

Particular attention should be paid to the way in which the patient breathes, and when the breathing is entirely through the mouth a dental prop should be placed between

the teeth to ensure this air-way remaining patent throughout the administration. It is advantageous to use a prop between the teeth even when a patient seems to breathe well through the nose. A cough is often due to pharyngeal irritation, especially in smokers, but the lungs should be examined for signs of bronchitis.

Artificial teeth must be removed unless very firmly fixed, and loose teeth should be noticed, as these may give trouble when it is necessary to insert a gag.

II.—ADMINISTRATION OF GENERAL ANÆSTHETICS.

Nitrous Oxide, or 'gas' as it is more generally called, is now almost always given by means of Hewitt's apparatus. A suitable face-piece is selected, and attached to the stop-cock, while the bag is half filled with gas. The face-piece should be carefully applied to the patient's face, and a few breaths of air are allowed, to see that the valves of the apparatus are working properly and that the face-piece is fitting accurately. The lower slot of the stop-cock is now closed, so that gas is breathed instead of air, and the signs of anæsthesia will soon be noticed. First the colour of the face gradually becomes darker, the pupils dilate, twitching movements known as 'jactitations' are noticed, generally beginning in the fingers or the smaller muscles of the face, and the peculiar 'stertor' associated with nitrous oxide is heard. If the face-piece is removed as soon as the first twitchings are noticed, a period of anæsthesia lasting on the average about thirty seconds will be obtained.

By interspersing a few breaths of air with the nitrous oxide, which may easily be done by opening the lower slot of the stop-cock, a longer and quieter anæsthesia may be obtained, lasting on the average from forty to fifty seconds. When this is done, the patient should not become cyanosed, and no marked jactitation or stertor should be observed. When air is given with gas the best sign of anæsthesia is the gradual increase in the depth and freedom of the respirations, with slight snoring, which is quite different from the loud stertor mentioned above. In giving air with gas in this way a little practice is necessary before the best results are obtained, and it should be remembered that children and anæmic girls require more air than robust men. When gas is given for a short operation, say one lasting for five minutes, it is obvious that air must be allowed, either by opening the lower slot, or by removing the face-piece from time to time.

Nitrous oxide may be given continuously by the nasal method for operations in the mouth, or, mixed with oxygen, with Hewitt's 'gas and oxygen' apparatus.

Gas and oxygen, with the addition of ether, is now given for longer operations with Boyle's apparatus; but space forbids more than the mention of these methods.

The great advantages of gas for short operations consist in its safety, the absence of any unpleasant smell or taste, the small amount of preparation of the patient which is required, and the rapid recovery, which is usually accompanied by no unpleasant after-effect. It is most frequently used in the single-dose method for the extraction of teeth and other dental operations; but when given continuously for a few minutes, short operations which would otherwise be painful, and which do not demand a great depth of anæsthesia, may easily be performed. Among these are the opening and draining of abscesses, removal of nails, moving stiff joints, etc. But without considerable experience it is not easy to give gas well for more than a few minutes, and when longer anæsthesia is required, it is wiser to change to ether.

Ethyl Chloride is generally employed to obtain a single-dose anæsthesia for operations in the mouth, as the extraction of teeth, or removal of tonsils and adenoids. It is very portable and does not require much apparatus. It may be given quite well in the bag of a Clover's inhaler, with a face-piece attached. The ethyl chloride should be sprayed into the bag, and the face-piece applied during expiration. The average dose required is 2 c.c. for a child, 3 c.c. for a woman, and 5 c.c. for a man. Anæsthesia is produced very rapidly: it is deeper, and lasts longer than that resulting from a single dose of nitrous oxide.

The rapidity of induction and the depth of the anæsthesia are very marked, and a child crying loudly, after a few inspirations, may be found to have a dilated pupil and no corneal reflex. Great caution should be exercised lest the anæsthesia become too deep, especially during the removal of tonsils and adenoids, as the coughing reflex is easily abolished, and blood may then enter the larynx.

Ethyl chloride may be given more safely on a Schimmelbusch mask as used for 'open'

ether. More will be required, but anæsthesia will be produced more slowly than with a closed bag, and can be more easily regulated. It may also be used as a preliminary to ether or mixtures.

Ether.—Ether may be administered by the 'open' or 'closed' method.

For the administration by the 'open' method, sixteen layers of ordinary surgical gauze are stretched on a Schimmelbusch frame, or one of its modified forms, and ether is gradually dropped on the gauze from a bottle.

A piece of gauze should be twisted into a rope and placed between the mask and the face, covering the eyes, but leaving the mouth and nose quite free; or a pad of Gamgee wool may be used, with a hole cut in it for the mouth and nose. By these means the free access of air is prevented, and the patient breathes through the gauze on the mask, and becomes anæsthetized more rapidly.

If no pad is used and a free supply of air is allowed, as is the case during an administration of chloroform, the method is more strictly an 'open' one; but the strength of the ether vapour then obtained is so low that it will generally be insufficient, except for patients in a feeble condition, or for the closing stages of a prolonged operation. Ether is dropped on the mask slowly at first, but in increasing quantities, though the gauze should never be saturated. The amount required varies considerably, depending on the vigour of the patient, the temperature of the room, etc. A preliminary injection of atropine (gr. $\frac{1}{100}$), about half an hour before the administration, should always be given. The induction is made more pleasant if it is begun with a mixture of chloroform and ether, such as the A.C.E. mixture; but ether alone should be given after the first two or three minutes.

In the 'closed' method the patient breathes into a bag attached to some form of apparatus by which the strength of the ether vapour is regulated. Clover's inhaler, with a large bore as suggested by Hewitt, is one of the best forms. In giving ether by one of the inhalers the face-piece is selected and fixed to the inhaler, and a measureful (2 oz.) of ether is poured into the latter. The anæsthetist should then blow through the apparatus to remove the ether vapour which is in the central tube. The bag is then attached and the inhaler applied to the patient's face during expiration only, so that the bag may be distended with his breath. When the bag is about one-half or two-thirds full the inhaler is kept applied to the face, and a few breaths are allowed before the indicator is turned. The actual administration of ether is then begun by slowly turning the indicator, and so allowing more and more of the respired air to pass through the ether chamber. The comfort of the patient, and the ease with which anæsthesia is produced, depend in great measure on the very slow and gradual way in which the indicator is moved, especially during the first two or three minutes. By giving too strong a dose at first the patient will be worried, and will either cough, or hold his breath and struggle; but if the administration is begun slowly and gradually, anæsthesia may generally be obtained in a few minutes without any trouble or discomfort. For vigorous men it is sometimes necessary to turn the indicator to 'Full'; but for women it is not necessary to go beyond $2\frac{1}{2}$ or 3, and with children $1\frac{1}{2}$ is quite sufficient. In all cases the strength of the vapour should be reduced as soon as anæsthesia is obtained. When full anæsthesia has been obtained the bag may be removed, thus practically converting the administration into an 'open' one. When this is done the indicator should be advanced, and if the anæsthesia becomes too light at any time the bag may be re-applied for two or three minutes.

The administration of ether is made much more pleasant by giving some nitrous oxide first. This may be easily done by filling a bag full of gas, and applying it to the ether inhaler in place of the usual small bag. The patient is allowed a few breaths of air through the valves as when gas is given alone, and the lower slot is then closed, so that the patient now breathes gas through the valves. When half the gas has been used in this way, the upper slot is closed, and rebreathing into the bag takes place without the action of any valves. The indicator is now turned rather more quickly than when ether is given alone, and when anæsthesia is obtained the gas bag may be removed, and the smaller bag substituted. This way of giving gas with a gradually increased proportion of ether is known as Clover's method.

Another method, known as Braine's, consists in placing the patient fully under the influence of nitrous oxide, that is, giving it till jactitation is noticed, and then giving a

full dose of ether at once. This may be done either with a Clover inhaler with the indicator at 3 or 'Full', or with an Ormsby inhaler. This method requires much practice.

With 'gas and ether', anæsthesia may with safety be obtained more quickly than with 'open' ether or chloroform and its mixtures, and a rapid loss of consciousness is an advantage in the case of very nervous patients.

Ether may also be given in a semi-open manner by using a Rendle's inhaler, giving a mixture (*see* **Mixtures**) till the patient is unconscious, and then pouring pure ether on the sponge, when required, instead of more mixture. The writer has found this specially suitable for women and children, and much less ether escapes into the room.

There are other methods of administering ether which in certain cases possess advantages, but which can only be mentioned here. A warmed ether vapour may be given with Shipway's apparatus, or ether may be administered by the intratracheal method with several forms of apparatus, of which Shipway's is the most convenient. This method was originally designed for lung surgery, but is now used for other operations, generally on the head and neck.

Ether may be given intravenously with a saline infusion by Rood's method ; and also as a rectal injection as suggested by Gwathmey. No special apparatus is required in the latter case, but a 50 per cent solution of ether in olive oil is slowly injected into the rectum about an hour before the operation. The dose required is 1 oz. of the mixture for every 20 lb. of the patient's weight. This method is useful for operations on patients in a poor general condition, such as the removal of an enlarged thyroid gland in Graves' disease, as the patient is partially anæsthetized before reaching the theatre, and very little more is required. It is important that the patient should not be disturbed after the injection has been given, and after the operation the remaining mixture should be washed out of the rectum.

Chloroform is frequently given from a piece of lint ; but as with this there is some chance of burning the skin, the method suggested by Lister is preferable. It consists in drawing the corner of a towel through a safety pin till a mask is formed reaching from the chin to the root of the nose. The best form of mask is Skinner's, which is a piece of flannel stretched over a light metal frame. With this there is less risk of the patient's face being burned, there is a freer admixture of air, and there is no possibility of the breathing being in any way obstructed, as sometimes happens when a piece of lint is carelessly allowed to fall over the mouth.

A few minims of chloroform are dropped on the lint, and the mask is held some inches above the patient's face, so that the first inspirations may contain a very weak proportion of the drug. The chloroform is added drop by drop as required, and the mask gradually brought nearer to the face.

As with ether, too strong a vapour will cause holding of the breath, coughing, or struggling, and much care should be exercised to prevent these. The respiration should be most carefully watched, and should be kept as free and as regular as possible. When the breath is held, the mask must be removed from the face to prevent too large a dose being taken with the next inspiration. The lips should be rubbed with a towel to stimulate the breathing, and when this is satisfactory the mask may gradually be restored to its former position, and more chloroform given. When the mask has been held too close to the face, or when the flannel has been saturated with the drug, the first deep inspiration after holding the breath has allowed patients to absorb a fatal dose. The part of the mask which lies over the mouth and nose may be kept moist with the drug, but liquid chloroform must not be allowed to drop from the edges of the frame, or the skin will be burnt.

Before any administration of chloroform the patient should be carefully prepared ; all clothes, etc., should be loosened, and the patient should be in the recumbent position. Though chloroform causes no congestion in the air-passages, it is most important that a free air-way should be maintained.

The careless administration of chloroform has resulted in many deaths, and several forms of regulating apparatus have now been devised in which it is not possible for the patient to inspire more than a definite proportion of chloroform vapour. The Vernon Harcourt inhaler is probably the most accurate. With it a definite chloroform vapour of from 0·2 to 2 per cent can be given, and by a further contrivance the strength can be increased to over 3 per cent. That the patient shall really receive these percentages it

is essential that the face-piece should fit perfectly accurately, and even then it is not always possible to obtain the deep anæsthesia which is sometimes required; but it is surprising to find how easily a sufficiently deep anæsthesia may be maintained in many cases with a very small percentage.

Chloroform may also be given by means of a face-piece made of lint or flannel attached to the tube of a Junker's inhaler. A fairly constant proportion of chloroform vapour can be presented to the patient, the strength varying with the rate and the vigour of the pumping. It may be raised to 4 per cent, which Lister calculated is all that is required; but if at any time a stronger vapour is needed, a few drops of chloroform may be added on the face-piece.

When an operation is being performed in the mouth, Junker's inhaler, with a mouth or nasal tube, is the only apparatus by which we are enabled to maintain anæsthesia, unless the surgeon perform laryngotomy, in which case the chloroform is given through the wound, preferably with a Hahn's tube. The latter is the most satisfactory method for very extensive operations, as it allows of the pharynx being tightly packed with sponges, and so prevents the entrance of blood into the larynx and trachea.

With chloroform there is less congestion of the air-passages, and also less secretion of mucus and saliva, which are so common with ether; but ether is so much safer, that whenever possible it should be chosen.

Mixtures.—Many attempts have been made to combine the good effects of chloroform and ether by giving them together in mixtures of different proportions. The best is the A.C.E. mixture, consisting of one part of absolute alcohol, two parts of chloroform, and three parts of ether. It should be kept in a dark cupboard, in stoppered bottles containing four ounces.

Mixtures are often made at the time of the administration, and in this case the alcohol may be omitted, and a mixture of two parts of chloroform to three of ether, or of one part of chloroform to two of ether, may be made by measuring the liquids, pouring them into a bottle, and gently shaking them before using.

Mixtures are especially suitable for children and for old and weakly patients. When very little anæsthetic is required, they may be given on a Skinner's mask; but when the patient requires more, a Rendle's inhaler will be found very suitable. In the case of an adult, a drachm of the mixture should be poured on the sponge, and the inhaler placed a few inches from the face. It is gradually brought nearer till it rests lightly against the face. After two, three, or four minutes, another drachm of the mixture should be poured on the sponge, and if necessary another dose at a similar interval; but it must be remembered that this anæsthetic is practically a diluted form of chloroform, and that more time should be allowed for anæsthesia to be obtained. If it be given too freely, or the air-supply to the patient be cut off too completely, the symptoms of chloroform poisoning will result from any mixture of which it forms a part.

III.—THE ANÆSTHETIC STATE.

Whatever may be the drug employed to produce anæsthesia, and however complicated may be the apparatus, the points to be noticed in the condition of the patient are the same.

Respiration.—It is most important that the respiration should be very carefully watched during the whole of the administration. While the patient is still conscious, there will be many variations both in depth and rhythm; but when consciousness has been abolished, it should become free and regular, and every effort must be made to keep it so. The great cause of obstructed breathing is the tongue, which tends to fall back and rest against the pharyngeal wall. To obviate this, the head should be well turned to one side, perferably to the right, unless the operation is being performed on the right side of the head, neck, or thorax, when it should of course be turned to the left. Pressure should be made with one or more fingers of the left hand behind the left angle of the patient's jaw, while the fingers of the right hand hook the chin forwards and upwards. By these means the tongue is carried forward, and at the same time the loose folds of mucous membrane which lie above the opening of the larynx are stretched, and so prevented from causing obstruction.

In some patients it will be found that the lower teeth become locked behind the upper

ones, so that, however much force be exerted, the jaw will not move forward. In these cases an attempt should be made to open the mouth and fix the lower teeth in front of the upper ones; but if this is not possible, a small prop should be placed between the teeth. When the breathing through the nose is obstructed, it is especially important that a clear air-way should be maintained through the mouth, and some administrators use a small prop between the teeth as a matter of routine. It should have a string or piece of tape attached to it to prevent its being swallowed.

When the operator requires the head to be kept in the middle line, it may be found impossible to prevent the tongue from falling back, even when firm pressure is exercised behind both angles of the jaw. In this event direct traction on the tongue must be employed. The ordinary forceps bruise the tongue so much that they may cause considerable pain, lasting for two or three days; when the tongue must be pulled forward for some time, it is better to use a simple ligature passed through its substance.

Respiration may be obstructed also by pressure on some part of the respiratory tract, as by an enlarged thyroid gland pressing on the trachea, or by fluid in the pleural or abdominal cavities. When this is the case the anæsthesia should be kept as light as possible till the pressure is relieved.

The breath is often 'held' when the anæsthesia is allowed to become too light, and vomiting is imminent; respiration will then be improved by rubbing the lips and then giving more of the anæsthetic. If vomiting occurs, the head should be turned to the side, and all vomited matter carefully removed from the mouth before any more anæsthetic is given.

When too much air is given, a condition of 'false anæsthesia' may be obtained, in which the patient breathes extremely quietly, and is apparently ready for the operation, but shows vigorous movements when the incision is made. This condition is most commonly noticed in infants; it is more likely to occur when the patient has been anæsthetized for some minutes before the surgeon is ready.

Pulse.—While a patient is being rendered unconscious, the pulse will vary considerably through the influence of excitement; but when anæsthesia has been established, it should become regular, of good volume, and of moderate rate. Though it is not necessary to observe the pulse as continuously as the respiration, it should be carefully watched, as it will generally give the first indication of the shock which a severe operation causes a patient, by becoming faster and smaller. It should be remembered that the pulse may be made fast and small by pushing ether unduly and so over-stimulating the circulation.

The Colour of the patient will be best observed in the lips and ears, and should never be allowed to become at all dusky. If cyanosis occurs, more care must be taken to keep the air-way clear, and to give more air.

Corneal Reflex.—The reflex movement of the eyelids produced by touching the sensitive cornea is one of the most useful guides to the anæsthetist. As a general rule this reflex should be abolished for the skin incision, and then in many operations it may be allowed to return. For instance, the anæsthesia will generally be sufficiently deep while the reflex is present in operations on the limbs, and even in many abdominal operations, when the surgeon is working on parts that are not very sensitive. Thus, for a long resection of intestine the corneal reflex may be abolished while the skin incision is made and the parts are placed in position; but while the intestines are being sewn the reflex may be allowed to return, care of course being taken that no other signs of light anæsthesia, such as straining and vomiting, are allowed. However light the anæsthesia which may be sufficient for the greater part of these operations, it is generally found necessary to deepen it while the abdominal wall is being manipulated at the close of the operation and the sutures are being inserted, as otherwise the operation may be ruined by vomiting at this critical moment.

For some operations the corneal reflex should always be retained; among these are the removal of tonsils, adenoids, and the thyroid gland, operations on the brain, pleura, etc. But in some patients vomiting sets in so soon after the return of the reflex that it is necessary to keep it absent on this account, though otherwise the operation in itself does not demand deep anæsthesia. This will be more noticeable in nervous patients, who secrete and swallow large quantities of saliva while they are waiting for the operation to begin, and in those who have been badly prepared. In testing the corneal reflex, care

must be taken that the cornea is not abraded, and whenever it is possible the eyes should be used alternately.

It should be remembered that in infants the corneal reflex is not so reliable as in adults, and that in these little patients the absence of reflex movements of the limbs when the skin is pinched is a more certain sign of anæsthesia.

The Size of the Pupil is a useful indication of the depth of anæsthesia. When a patient becomes unconscious the pupils are generally dilated, but as the anæsthesia deepens they contract, and should be kept small throughout the operation. If the pupil becomes very large while the corneal reflex is distinctly present, it is a sign that the patient is coming round, and more anæsthetic should be given. But if no corneal reflex can be obtained, and the pupil becomes dilated, this is generally a sign of danger, and the anæsthetic should be withdrawn till the pupil contracts. A very small pupil, known as the 'pin-point' pupil, is often a precursor of vomiting, especially when chloroform is being given, and when the vomiting actually takes place the pupil may suddenly dilate.

Relaxation of the Muscles.—In many operations the utmost degree of relaxation is required. This may be obtained generally by giving ether more freely, but occasionally it may be necessary to give some mixture for a short time and then return to ether.

To obtain satisfactory anæsthesia all the above-mentioned guides should be watched, and one must not be used to the exclusion of the others, or disaster may result.

Condition of Danger.—Besides the obstructed respiration mentioned above, a dangerous condition may arise from any of three causes : (1) An overdose of the anæsthetic ; (2) The loss of a large quantity of blood ; or (3) The shock of a severe or prolonged operation ; and frequently two or more of these causes are combined.

The signs of danger may occur with startling rapidity, as in the case of syncope from an overdose of chloroform, but more commonly the onset is gradual. The breathing becomes more and more shallow, the pulse faster and smaller, the pupil large, with no contraction to light, while the corneal reflex is lost, the eyelids separate, the face becomes pale, the nose feels cold to the touch, and sweat may break out on the forehead. When failure of respiration is the principal cause of anxiety the breathing will often be noticed to become shallow, or stop altogether, while the pulse remains fairly good ; but danger may arise without the possibility of saying whether the pulse or respiration failed first.

In cases of sudden danger, treatment must be prompt and thorough. The anæsthetic, of course, must be withdrawn, the mouth opened with a gag, and the tongue drawn forward and held in position by an assistant. A finger should be passed into the pharynx to exclude the presence of any foreign body, such as vomited matter, etc. The patient should then be drawn up the table till the head is just hanging over the end, and, if the mechanism of the table permit it, the whole body may be raised. Artificial respiration must now be begun by grasping an elbow of the patient in each hand, and compressing them firmly against the chest-wall. The arms are then swept upwards and outwards at their full extent till the hands meet above the head, and they are then slowly brought down again and pressed against the chest wall as before. Great help may be given by an assistant pressing against the diaphragm through the abdominal wall at the time that the arms are brought down to the chest, and this movement will be of special use when the chest wall is rigid. It should be remembered that the success of artificial respiration depends on the thoroughness with which the movements are performed, that they should not be made more frequently than sixteen times in a minute, and should be continued for some minutes after all obvious signs of life have disappeared. If oxygen is available it should be administered while artificial respiration is being performed.

Hot cloths should be placed over the præcordium, alternately with cold ones, and strychnine ($\frac{1}{30}$ gr.) or ether (20 min.) be injected hypodermically. Brandy may be given hypodermically in a dose of 2 drachms, or an ounce with a few ounces of water per rectum.

A faradic current may be passed from the second or third intercostal space in front to the spine behind, and direct stimulation of the heart by massage has apparently saved some lives. The heart will be reached most easily by an incision through the upper part of the abdominal wall, followed when necessary by one through the diaphragm.

When the serious condition of the patient develops more slowly, the treatment should be that given under **Shock** (p. 41).

When infants and very little children stop breathing, they should be treated by taking both their feet in the left hand and lifting the patient up till the head just rests on the table. The right forefinger should then be placed in the mouth and used to hook the tongue forward. An assistant now performs artificial respiration by compressing the chest walls firmly and then allowing them to resume their usual position, which their great elasticity enables them easily to do.

IV.—RECOVERY FROM ANÆSTHESIA.

In removing a patient from the operating-table to the bed, he should be disturbed no more than is absolutely necessary, as want of care in lifting and placing in bed is likely to produce vomiting. The bed should have been previously warmed with hot-water bottles, but these must be taken out before the patient is moved from the operating-table. They may be replaced, when necessary, when the patient is fully conscious. During the return to consciousness the patient should be kept in a darkened room, and as quiet as possible. He should be prevented from talking, and seeing relations and friends, as any of these causes of excitement will generally be followed by severe headache. The room should be warm, and well ventilated, so that the smell of the anæsthetic may be removed, but the patient must not be placed in a direct draught, as this has been the cause of bronchitis in patients who have inhaled ether for a considerable time. If the surgeon does not object, it is well to place the patient on one side with a pillow pushed against the back, and after a time he may be turned on to the other side. When there is much blood in the mouth, as after the removal of adenoids, etc., or when vomiting is taking place, an almost prone position is the best.

No food should be given for four hours after the anæsthetic, or even for longer, if the patient will wait. Most of the vomiting after anæsthesia is caused by injudicious preparation, or through giving food by the mouth too soon after the recovery. After an unimportant operation some weak tea is the most suitable liquid to begin with, and if this is taken without any discomfort a little food may be allowed in an hour.

After severe and important operations on the abdomen the after-feeding of the patient is a matter of great importance, and one which is in the hands of the surgeon, and not of the anæsthetist.

Vomiting.—Slight vomiting before the return of consciousness is an advantage to the patient; but persistent vomiting is sometimes troublesome. It should be treated by small doses of hot water, given in an earthenware spoon so that the lips may not be burned, for the water should be as hot as can be taken, as warm water is more likely to encourage the vomiting. When a small dose of water does not relieve it, a tumblerful containing a little bicarbonate of soda may occasionally do so. Some patients do better with sips of iced soda-water or champagne, or sucking small pieces of ice, while in others the vomiting may be stopped by a drop of tincture of iodine given on a lump of sugar. Whenever it is possible the patient should be well propped up in bed. Some persons find the taste of ether diminished by sucking peppermints.

Thirst is best treated by washing the mouth out with water containing some lemon-juice, and by giving rectal injections of hot water.

Bronchitis is generally the result of exposure, except after operations in the mouth, when it may be caused by the inhalation of septic material from the wound. It must be treated on ordinary lines.

Shock.—During a severe operation, or at its conclusion, the patient may be found in a state of shock, with small rapid pulse, shallow breathing, cold nose, etc., and very careful treatment is sometimes necessary. The foot of the operating-table or bed should first be well elevated on blocks or boxes, and the limbs covered with cotton-wool and bandaged. The patient must be made as warm as possible by hot-water bottles, and the room must be kept thoroughly warm. Saline fluid should be given by the rectum, or into the axillæ or thighs; but if the shock is severe, intravenous infusion is best; and adrenalin (1–40,000) may then be added to the fluid. Strychnine and alcohol have fallen into disrepute, but a hypodermic injection of pituitary extract is often useful. Inhalation of oxygen, with gentle artificial respiration, may also be of assistance.

If the patient recovers from the shock, and the operation is continued, 'open' ether should be given as the anæsthetic. (*See also* SHOCK, SURGICAL.)

V.—THE CHOICE OF ANÆSTHETIC.

The relative safety of the various anæsthetics should first be considered. Nitrous oxide is certainly the safest that we possess, ether comes next, then mixtures of ether and chloroform, and lastly chloroform, which is undoubtedly the most dangerous. Ethyl chloride, if given with care, should be placed between ether and chloroform, but in careless hands it is almost as dangerous as the latter. The patient and the operation to be performed have both to be considered.

As regards *the patient*, nitrous oxide, with air or oxygen, may be given to all except very young children, for whom a small quantity of some mixture of ether and chloroform, given on a Skinner's mask, is the best anæsthetic. When nitrous oxide is unsuitable, 'open' ether should be given, unless there is acute inflammation of some part of the respiratory tract, or very marked degeneration of the arteries, when a mixture, or pure chloroform, should be given.

The Operation.—For dental cases and other short operations on patients sitting in a chair, such as the removal of tonsils or adenoids, the choice lies between nitrous oxide, ethyl chloride, and ether. For the majority of these cases there is no drug so satisfactory as nitrous oxide given with some air or oxygen. With it an average anæsthesia of half a minute can be expected, with a speedy, pleasant recovery. Ethyl chloride will give a longer period of anæsthesia, but it is not so safe as gas, and the recovery from it is likely to be followed by headache and vomiting, especially if a large dose has been given. Some anæsthetists prefer ethyl chloride to gas for children, as they are often very restless in the chair, and too frightened to allow the face-piece to be fitted accurately. When this is the case it is much more convenient if the operation can be done in the recumbent posture, as small patients so easily slip into a bad position when anæsthetized in a chair: ethyl chloride will then be safer, and a better anæsthesia will be obtained.

If an anæsthesia of two or three minutes is required for the extraction of difficult or numerous teeth, this may be obtained by means of gas given by the nasal method; but as some practice is required before this can be used satisfactorily, it is better for those who give anæsthetics only occasionally to have recourse to ether, which may quite safely be administered to a patient in a sitting posture.

On no account whatever should chloroform, or any mixture which contains chloroform, be given to a patient sitting in a chair; if gas or ether is unsuitable, or not available, and chloroform is to be given, the patient must lie on a couch or bed. Neglect of this precaution has been the most fruitful cause of deaths under chloroform.

Apart from short operations in the mouth, in which the anæsthetist's apparatus must as a rule be removed before the operator can begin, there are many small operations, such as the opening of abscesses, removing nails, or very painful dressings, for which gas may be used with great advantage. Care must be taken that the gas be not unduly pushed, so that the patient becomes cyanosed and jactitates; air must be given frequently by opening the lower slot for a breath or two, or the face-piece may be removed from the face. For these short cases gas and oxygen given with Hewitt's apparatus is the best method. If gas is not available, ethyl chloride may be given; but the longer the anæsthesia required, the less advantage is there in choosing gas or ethyl chloride instead of ether.

When the operation is to last more than three or four minutes, the routine anæsthetic should be 'open' ether preceded by a small amount of some mixture of ether and chloroform. But there are occasions when ether should be avoided and chloroform should be employed:—

(1) When ether would be unsuitable on account of the congestion it produces, as in operations on the brain, removal of the thyroid gland, operations on the eye, etc.; (2) When it would increase the difficulties of the operator through the secretion of mucus and saliva, as in operations on the mouth and larynx; (3) When the ether apparatus would be in the way of the surgeon, as in operations on the face; but here the anæsthesia may sometimes be begun with ether, and a change to chloroform made later; (4) When a cautery is to be used near the face; (5) When relaxation of muscular spasm, combined with light anæsthesia, is required, as in painful labour, eclampsia, and tetanus.

VI.—LOCAL ANÆSTHESIA OR ANALGESIA.

When the practitioner is single-handed, the administration of a general anæsthetic for an operation, however simple, should not be attempted. When the general condition of the patient is extremely serious, or the operation to be performed is trivial, the freedom from pain may be obtained by local instead of general anæsthesia. The decision as to whether general or local anæsthesia should be employed depends on the nature of the operation, the practitioner's experience of the various methods, and the mental condition of the patient; but in this country most people, and indeed most surgeons, prefer general anæsthesia to local.

Analgesia may be obtained in several ways: by cold, by local application, by the 'infiltration' method, and also by spinal injections.

Freezing.—The skin may be frozen by means of two parts of pounded ice and one part of salt mixed together and applied to the part in a rubber bag. The skin, when frozen, becomes white and hard. Freezing may also be done with an ether spray, but the best way of producing analgesia by cold is by a spray of ethyl chloride. In using this it is important that the nozzle of the bottle should be small, and that it should not be held too near, so that only a fine spray falls on to the part to be frozen. This method of analgesia by cold is only suitable for simple operations, such as the opening of an abscess, and pain may be experienced when the skin thaws.

Local Application.—The drugs most commonly employed to produce local anæsthesia are cocaine hydrochloride, or eucaine hydrochlorate dissolved in water. For operations on the eye, a 4 per cent cocaine solution will be sufficient, a little being dropped into the eye at intervals of two minutes, and in ten minutes the operation may be performed. Soluble tabloids are now sold which may be placed under the lid, instead of a solution. For the mucous membrane of the mouth and nose, a 4 or 5 per cent solution may be used in a spray; or a small piece of cotton-wool or a strip of gauze, soaked in this solution, to which a few drops of 1–1000 adrenalin may be added, may be applied to the part and left there for five minutes; or a strong 10 per cent solution may be painted on the part. This 10 per cent solution may be used also on the gums to prevent the pain of several dental manipulations. For the extraction of teeth, local anæsthesia is now frequently employed, but for details of the method a book on dental surgery should be consulted. For the passage of a catheter, the urethra may be made insensitive by a 2 per cent solution, used in a special syringe.

The skin cannot as a rule be rendered insensitive without a solution as strong as 20 per cent, and better results will be obtained with infiltration; but for the removal of minute tumours, a few minims of a 5 or 10 per cent solution may be injected into the tissues round the base, and this method will also be of service in treating crushed fingers. Some surgeons apply a rubber band to the base of the finger with the object of confining the cocaine to the part.

Some persons are very susceptible to cocaine, and soon show symptoms of poisoning. Among the most usual of these are giddiness, with great difficulty in breathing, and a feeling of oppression. The patient becomes pale, with dilated pupils, and a slow and feeble pulse. Occasionally restlessness and irregular convulsive movements, or delirium, will be observed. Dangerous symptoms are less frequent when the patient has had food or a stimulant before the application of the cocaine, and so operations under cocaine are better performed after than before a meal. When the signs of poisoning are noticed, the patient must be laid on a couch with the feet elevated. All clothing which hinders respiration must be loosened, ammonia or nitrite of amyl held to the nostrils, and occasionally artificial respiration may be required. The patient should be kept warm by hot bottles, but the windows should be opened to allow a free supply of air. As soon as he can swallow he should be given hot tea, coffee, or brandy, and should not be allowed to sit up till he is feeling quite recovered.

Eucaine is much safer than cocaine, and should be used in a 4 per cent solution in water.

Infiltration.—For small operations under local anæsthesia, the infiltration method is the best. A solution should be prepared consisting of β-eucaine 1 part, sodium chloride 8 parts, water 1000 parts. This solution may be sterilized by boiling without affecting

the eucaine. A convenient method of making the eucaine solution is to have prepared some gelatin capsules, each containing β-eucaine 0·2 grm., sodium chloride 0·8 grm.; the solution is made by dropping one of these capsules into 100 c.c. of boiling water, and allowing it to cool. A 2 per cent solution of novocain is frequently used with good results. Adrenalin (1–1000), in the proportion of 3 minims to a drachm, may with advantage be added to these solutions, as it constricts the vessels and so diminishes bleeding, and limits the analgesic effects to the region injected.

A syringe in good working order, and capable of holding 10 c.c., should be sterilized and filled with solution. The skin having been painted with iodine, the needle is inserted into the skin (not under it) and a few drops of the solution injected. A wheal will be produced, and the syringe is removed and inserted at the side of this, and a few more drops of solution injected. This is repeated till the whole area of the skin which it is desired to render analgesic has been made œdematous with the fluid. Some of the solution is then injected hypodermically (under the skin), and into the deeper structures if the operation requires this. The incision may be made after twenty minutes, and the analgesia will last about that time; but if the operation is prolonged, more of the solution may have to be used from time to time.

The œdema produced by infiltration considerably alters the appearance of the part, and suppuration after operations performed in this manner is not unknown; so the practitioner is advised to restrict its use to the removal of small tumours of the skin till he has had some experience of the method. But with practice most minor surgical operations can be done by this means, and some surgeons use it for more important operations, such as herniæ, etc., and use deep injections for the treatment of fractures and dislocations.

There is little risk of poisoning either with eucaine or novocain; as with cocaine, it is better that the patient should have had some food not long before the operation.

It must be remembered that it is most difficult to render an inflamed area analgesic by local means, and that death from œdema of the glottis has followed infiltration of the structures round the tongue. Children are unsuitable subjects for this method, and many nervous persons will object to it.

For a description of the regional anæsthesia which may be obtained by perineural injections, for local anæsthesia for dental operations, and for spinal anæsthesia, other manuals should be consulted. *R. J. Probyn-Williams.*

ANEURYSM, SURGICAL TREATMENT OF.—A brief consideration of two conspicuous facts in connection with the natural history of aneurysm will at once lead us to the subject of treatment. One of these is the general tendency which exists towards rupture of the sac. It emphasizes, of course, the necessity for surgical interference whenever possible. The other is that spontaneous cure can occur. The methods by which this is brought about in nature are precisely those which we endeavour to reproduce artificially by means of surgery. There is no method of treatment known to us which is not an imitation of some strictly spontaneous curative process. Nature's means of effecting a cure, and our imitations of them, may be thus enumerated and compared. They are:—

1. Spontaneous deposit of clot in the aneurysm brought about by diminished flow through the vessel, or disturbance of clot causing a block in the afferent or efferent vessel. In treatment, compression or ligature of the vessel, and manipulation for the detachment of emboli, represent these processes.

2. Suppuration and gangrene, with obliteration of or destruction of the sac. These are imitated by the Matas operation or by excision.

3. Pressure on the artery of supply by the aneurysmal tumour. This is represented in treatment by flexion of the limb.

4. Inflammation round the sac, which spreads to it and causes thrombosis. A counterpart of this condition is obtained by means of irritating injections around the sac.

The most important, because the safest and most generally applicable, methods of treatment are those which bring about active or passive clotting in the aneurysm, through lessening or arresting the circulation in the vessel above, and in the tumour.

Certain methods which have been employed, but are now abandoned or seldom used, may be first mentioned. They ought not to be lost sight of, for some of them may, and probably will, in the future prove to be capable of more successful application than in the past, and history has revealed, in surgery as elsewhere, a well-known tendency to repeat itself.

Injection of the Sac by Coagulating Fluids has offered most promise, but the risks of embolism, inflammation, and sloughing of the sac have been found dangers serious enough to discredit the method.

Introduction of Foreign Bodies into the Sac.—Wire, horsehair, silkworm gut, catgut, etc., have been introduced into the sac with the object of producing coagulation of its contents. In some cases metallic wire and electrolysis have been combined, and a very few favourable results have been recorded. This operation should be reserved for otherwise hopeless cases.

Galvanopuncture has proved no more successful in the treatment of surgical aneurysm than in that of internal cases (for details see Dr. Drummond's note, under ANEURYSM, THORACIC, *infra*). It may be well to mention that many deaths have resulted from surgical defaults and from cellulitis in the neighbourhood of the punctures.

Parenchymatous Injection of Ergotine.—This is injected with an ordinary hypodermic syringe (10 to 15 min.) into the tissues surrounding the aneurysm, but not into the sac. If after two or three injections there is no improvement, it is useless to persevere.

Manipulation.—The sac is emptied by gentle and continued pressure. Its walls are then rubbed together in order to detach some portion of the lining clot, in the hope that the afferent or efferent vessel may be plugged by it, or that the detached clot should increase its size *in situ* by fresh deposit upon its surface. The fear of embolism has interdicted this form of treatment.

Needling of the Interior of the Sac (see ANEURYSM, THORACIC) is the most promising of all methods under present consideration, and is specially likely to prove a useful addition to methods of compression.

I.—PRESSURE TREATMENT.

Of all means, apart from operation, pressure is by far the most important in the treatment of aneurysm. The compression may be applied *directly* to the aneurysm, or *indirectly* to its vessel of supply.

Direct Pressure.—Used in unsuitable cases, this has done much harm. On the other hand, it has proved most serviceable as a curative agent in cases where clotting was first brought about by indirect pressure, or by ligature above the sac, but where, nevertheless, pulsation had returned later on. Careful watching is necessary, and the pressure must not be severe enough to cause sloughing or ulceration of the skin over the sac.

The application of this method of treatment, say to a popliteal aneurysm, would be as follows: The limb is bandaged from the toes to below the knee, a well-padded splint is fixed to the front of the leg and thigh, reaching from the groin above to the ankle below, and leaving the aneurysmal tumour and popliteal space exposed to view. A thick compress, such as a well-wrung sponge, should be firmly but not tightly bandaged as a pressure pad over the swelling, and the whole limb should be elevated to at least half a right angle. The toes below should be frequently examined to determine the condition of the circulation. Pain of any severity demands removal of the bandages.

Indirect Compression.—This being the most important method of treatment apart from operation, its principles are to be remembered, and should be considered in detail.

Either by fingers or instruments the circulation can be pressure-controlled, whether on the proximal or the distal side, in the majority of aneurysms.

By pressure on the proximal side control may be made complete or incomplete. The object of the former is to fill the sac with clot suddenly (the passive clot); of the latter, to allow of the gradual deposition of laminated clot (the active clot). Complete control is usually so painful as to require anæsthesia, and it may be some hours before clotting in the aneurysm occurs. If hardening of the aneurysm shows that consolidation is taking place, the case is hopeful, and with care it is likely that a cure will be brought about. So soon as consolidation has occurred, the pressure may be slightly relaxed, but it should be maintained in such a manner as to diminish the force of the blood-current

for at least five hours, during which the newly-formed clot has a chance of consolidating. Even after definite hardening and arrest of the pulsation in the aneurysm, it is possible for the clot to be dissolved and washed away, and for pulsation to return. Rupture of the aneurysm has been known to occur shortly after the commencement of this treatment, and a rapid increase in the growth of the swelling is a danger signal which must not be allowed to pass unheeded.

To carry out this treatment satisfactorily relays of assistants are required. There should be one to observe the condition of the aneurysmal tumour, a second to compress the vessel, and a third ready to take the place of one or other when fatigued. A shot-bag or other weight suspended over the fingers is an aid, but the duties are nevertheless so fatiguing that it is necessary to have a change of assistants every three or four hours. The patient ought to lie comfortably, and the surface points over which pressure effectually controls the circulation should be marked out as an aid to relieving the skin from too continuous pressure on one spot.

It is impossible to predict the cases in which this treatment will succeed, or how long it may require to be continued.

The chief advantages of digital over instrumental pressure are, that it can be more easily regulated, because it allows of slight changes in position of the pressure-points upon the skin, and so diminishes the risk of pressure-sore ; that it is less painful ; and that it gives better opportunity for avoidance of pressure on the accompanying vein. It is chiefly applicable in cases of high carotid, axillary, femoral, popliteal, and brachial aneurysms. Pressure can be kept up so long as it is borne without great inconvenience, but it is usually necessary to discontinue it at night and allow the patient to sleep. During the intervals of rest a supporting pad and bandage may be worn in order to diminish the activity of the circulation in the aneurysm ; or in the case of a popliteal, or of a brachial aneurysm at the bend of the elbow, flexion of the limb secures the same result. Success may be attained by this method after months or even years of trial. The greatest success has followed continuous pressure and entire arrest of the circulation through the aneurysm for a limited number of hours.

Many instruments on the tourniquet principle have been employed in place of fingers to compress the artery while avoiding pressure on any accompanying vein, and allowing, usually, of the passage of a continuous weak and diminished stream through the sac. When using such instruments the limb below the aneurysm should be bandaged, and the contact point of the pressure-pad shifted from time to time to prevent damage to the skin.

Cure may be gradual, as shown by the aneurysm getting harder, and pulsation and expansion diminishing ; or it may be sudden from filling up of the sac with clot. The patient requires careful and constant skilled supervision. The most courageous and obedient are apt to lose patience when restricted to one position in bed, while they are enduring pain and suffering from loss of sleep and exhaustion. The use of morphia or of some other sedative is necessary in the majority of cases, and even with these aids it may still be impossible for the patient to tolerate the treatment.

Rapid Pressure Method.—This was first applied to the abdominal aorta by Dr. William Murray, of Newcastle-on-Tyne, and with success. It has since been used for aneurysms of the limbs. A degree of pressure sufficient to arrest pulsation in the sac is brought to bear on the vessel above the aneurysm for a period varying from eight to eighteen hours. Few patients can tolerate the necessary pressure without narcotics, and if morphia does not suffice it is necessary to use chloroform, though the anæsthesia need only be light, and can be maintained for several hours if opportunities for feeding are provided for.

Reid's Method.—The principle in this method is to produce rapid coagulation of the blood, which is made to fill the aneurysm and its vessel of supply. Taking popliteal aneurysm as an example, it is carried into effect thus : An elastic bandage is firmly applied from the toes to the lower border of the tumour ; a second from a short distance above the tumour to the thigh, leaving the aneurysm and a small portion of its vessels unemptied and unsupported ; then above the upper bandage an indiarubber tourniquet is fixed round the limb, firmly enough to arrest the circulation, and the bandages below are removed. The tourniquet must be kept in position for an hour, during which the limb should be pulseless. Meanwhile the aneurysm must be carefully watched, and, if it enlarges, support must be given to it by pad and bandage. Before removal of the

tourniquet, arrangements will be made for compression of the artery above by digital or instrumental pressure. For aneurysms higher up than in the instance we have been considering, the use of a tourniquet may not be possible ; the artery above is then controlled by digital pressure. Digital pressure is also to be maintained whilst the tourniquet is removed, when the surgeon who is feeling the aneurysm dictates how much the pressure is to be relaxed. If the tumour appears to have consolidated completely, a continuous pressure on the femoral artery for three or four hours will suffice to cure it in a majority of cases, but the circulation should be lightly controlled by digital pressure for three or four days. If some pulsation be still perceptible, the cure may be completed by direct pressure on the aneurysm, as previously described ; or, if no effect has been produced, the attempt should be given up for the time, and another made after a week of rest, or some other method of attack chosen.

In the early stage of the application much pain may not be complained of, but in a short though varying time it becomes intolerable, and either morphia, or chloroform, or both, are needed. Careful watch must be kept on the pulse as a guide to the state of the general circulation, and on the toes in order to detect the premonitions of gangrene.

Compression by Flexion of the Limb.—In aneurysms, by choice at the bend of the elbow or in the popliteal space—especially of the sacculated variety, and with thick sac wall—if moderate (not forcible) flexion of the limb produces arrest of pulsation, a cure can be brought about by maintaining that position. The same method can aid the cure in consolidation started by other means.

As regards selection of cases, fusiform aneurysms are never favourable ; sacculated aneurysms, only when the mouth of the sac is not large enough to allow of active circulation in the tumour ; popliteal and brachial (at bend of elbow) are the cases most suited to pressure by flexion of the limb. It is to be avoided in cases of thin-walled aneurysms which are increasing in size. Those in the groin and axilla are seldom benefited by it, and large aneurysms in the groin have been ruptured by flexion of the hip.

Pressure on the Artery above, of such degree as to diminish but not to arrest the circulation, is most likely to succeed when the swelling is hard and the pulsation not forcible, i.e., where some clot has already been deposited in the sac, and when the patient is intelligent and placid enough to aid in the treatment.

Total Arrest of the Circulation by pressure on the artery of supply is used in cases of abdominal, inguinal, and carotid aneurysms, i.e., in situations where prolonged pressure cannot be borne, and where the artery can be effectually compressed against a bony prominence. It has also been used successfully for aneurysms of the limbs of patients unable to tolerate the more gradual method. The elastic bandage and tourniquet method is useful in recent aneurysms which are not too rapidly increasing in size and are not too thin-walled, and where the heart is not diseased and the arteries are not exceptionally rigid.

The objections to pressure treatment are :—

1. That it is painful. Some patients cannot bear it in the most moderate degree, and all find a prolonged course so exhausting as to be almost, if not quite, intolerable.

2. That it may not cure the aneurysm. Even after months of determined effort and painful experience, a considerable proportion of patients will not be cured.

3. That after 'cure' there is some tendency to relapse. It may be after a few hours or after a few weeks that pulsation returns in the aneurysm.

4. That the treatment is dangerous : (*a*) Rupture may take place soon after the treatment is commenced, or rapid extension of the swelling point to its probable occurrence ; (*b*) Gangrene of the limb below may occur, probably in some cases from pressure involving the vein as well as the artery, though it is only fair to state that gangrene is a danger common in greater or less degree to all forms of treatment.

5. Suppuration of the sac may happen in cases where the aneurysm has been suddenly 'cured' by the formation of a passive clot.

6. Sepsis. All sorts of septic-wound complications have followed sores produced by too active or too prolonged pressure over the vessels.

7. Subsequent operation may be made more difficult owing to the formation of pressure-sores ; or because pressure may have increased the collateral circulation to such an extent as to make operation a failure ; or through the vessels being so matted to their

surroundings after prolonged pressure as to make ligature a serious and difficult proceeding.

It may be said in conclusion, that while these methods have all proved useful in the past, and in days when operations were dreaded by patients on account of pain and by surgeons through fear of sepsis, their scope now has become greatly limited, and their use restricted to exceptional cases which promise to respond readily to such treatment.

II.—OPERATIVE TREATMENT.

The 'Matas' Operation.—The design of this, for the present the ideal operation, is to open and empty the sac, and in fusiform aneurysm to obliterate it by a series of tier sutures, but in saccular ones to close the opening into the vessel, and then obliterate the sac by tier sutures, leaving a sufficient channel for the circulation. The operation produces the same result in a quarter of an hour as the processes of nature would take many months to accomplish. I am now convinced that this is, so far, the best operation devised for the cure of aneurysm, when satisfactory control of the circulation, as in the limbs, can be effected.

Suture of the Aneurysmal Openings into vessels, after the separation of the latter by dissection, has met with its most useful application in the case of arteriovenous aneurysm, but for both these new methods there will be a larger place in the future.

Excision of the Sac.—My last experience of excision of a popliteal aneurysm has made me less enthusiastic than I then was as to the universal applicability of the popular method of excision of the sac.

The patient was a vigorous-looking man with a small but leaking popliteal aneurysm, which was easily dissected out. The artery above the aneurysm was so soft and brittle that a thick catgut ligature cut through it like cheese. Another was applied higher up. This held. I was so impressed by the brittleness of the vessel that special nurses were told off to watch for hæmorrhage. The third day after the operation profuse hæmorrhage occurred, and the femoral artery was successfully tied in Hunter's canal. The following day gangrene of the foot had set in, and amputation was performed through the thigh. The patient recovered, but lost his leg. Further experience has taught me that this man could have been safely cured, and that his leg would have been preserved, by the obliterative endo-aneurysmorrhaphy method of Matas. The case recorded is of interest, as it emphasizes the old view, which has latterly been ignored and even denied, that the vessels in the neighbourhood of the sac are occasionally so brittle and diseased that there is danger in applying a ligature to them.

Statistics show the safety of excision of the sac. It is also proved that there is less chance of gangrene following it than is the case with an operation by ligature ; that the cure is certain ; and that no after troubles, such as arise from the presence of a shrunken sac, are possible. The most brilliant application of this method of attack has been found in the treatment of ruptured diffuse aneurysms of the limbs where amputation used to be the only alternative. By turning out the escaped blood and finding and excising the aneurysm, many of these serious cases can be brought to a successful issue. Even in these cases the operation has been displaced by the operation of Matas, which can be done without serious disturbance of the surrounding parts.

Ligature of the Artery of Supply.—This may be (1) *Proximal*, immediately above the aneurysm, or some distance above it ; or (2) *Distal*, below the aneurysm.

1. *Proximal Ligature.*—In all but exceptional cases, the nearer a ligature can be applied above the aneurysm the better, so that the obstruction in the aneurysm and that in the vessel affected by the ligature may combine. The immediate effect of the ligature is to arrest pulsation in the sac, which shrinks and should become solid. The diminished circulation in the limb below demands treatment by warm wrapping, elevation, artificial maintenance of heat, and prolonged, frequently-repeated upward rubbing, in order to aid the venous circulation. Following ligature there may be :—

a. Recurrence of pulsation. In the course of a few days after successful ligature, pulsation may recur in the aneurysm, but as a rule it disappears in a few days more, of its own accord, or with slight aid. Bandaging the elevated limb and compression of the aneurysmal swelling may first be tried. Then digital pressure upon, or ligature of, those collateral branches which have influence upon its pulsation ; or ligature of the artery

distal to the sac may be resorted to. If a fair trial of these means fail, the Matas operation is indicated.

b. Gangrene. If the limb continue to be shrunken, pallid, and cold, definite gangrene is to be expected before the end of the first week. If the gangrene be dry, the whole extremity may, after thorough cleansing, be wrapped in antiseptic wadding, and the appearance of a line of demarcation awaited. If the gangrene be septic and moist, the sooner the limb can be amputated above the aneurysm the better.

c. Suppuration in the sac. The ordinary evidences of pus formation in the sac indicate the same treatment as for suppuration elsewhere. It should be freely opened, its contents evacuated, its interior packed. If inflammation has not extended from the sac into the surrounding tissues so as to make excision impossible, this will be the best treatment. Amputation will offer the best chance if secondary hæmorrhage after suppuration should occur.

2. *Distal Ligature.*—The only condition in which this has been employed with encouraging success has been in aneurysms of the lower part of the common carotid artery.

Recent advances in blood-vessel surgery justify the expectation that, in the near future, cases in which the blood-vessels on either side of the aneurysm are fairly healthy will be treated by excision of the sac and restoration of the vessel by the transplantation of a graft.

Surgical aneurysm is the result of syphilitic disease of the blood-vessels almost as frequently as medical aneurysm. If there is a history, or other evidence, of this disease, including a positive Wassermann reaction, treatment of the aneurysm should be followed by an antisyphilitic course.

Aneurysmal Varix and Arteriovenous Aneurysm.

The dangers and difficulties of operation in such cases, where large vessels are involved and where the circulation is difficult to control, must be fully realized; yet the dangers and discomforts resulting from the lesions may be so serious that the risks of operation have to be faced. In cases of aneurysmal varix, palliation may be obtained by the use of an elastic bandage, and occasionally a pad over the orifice of communication can be so effectually applied as to remove all the distressing symptoms. When, however, a tumour is present, operation is a necessity, for the aneurysmal swelling is progressive and will eventually rupture. The operation usually implies separating the artery and vein, and tying both vessels above and below the opening. After separation it may be possible to close the opening in each by carefully applied sutures, and this is the best surgery.

Aneurysms of the Upper Extremity.

Axillary Aneurysms.—On account of their rapid growth, the serious pressure symptoms they occasion, and their liability to rupture, active treatment is essential. There are four methods of attack, from which a choice must be made: (1) *Pressure*; (2) *Ligature of the artery above the aneurysm*; (3) *Excision of the sac*; (4) *Matas' operation*.

1. *Pressure* is so painful as to necessitate the use of an anæsthetic, and relays of assistants are required in order to hasten the result. The method of application is as follows: The spot above the clavicle on the third part of the subclavian artery, pressure on which completely arrests the circulation in the aneurysm and in the vessels below, is to be noted and marked. Then an elastic bandage is applied firmly to the limb from below up to the axilla, but not over the aneurysm. By pressure on the third part of the subclavian the circulation in the aneurysm must be totally arrested, and the elastic-bandage pressure should be maintained for one hour, after which digital pressure should be continued for three hours more, and then gradually relaxed.

In fat or unusually muscular subjects it may be impossible to control the circulation with the skin undivided. It would be possible and proper in such a case to make the pressure through a wound over the vessel. It is almost superfluous to add that such a wound could be safely made only under perfect surgical conditions, and that those who compress the vessel would necessarily wear sterile indiarubber gloves.

2. *Ligature of the Artery above the Aneurysm.*—If the aneurysm involves the lower part of the artery it will be possible to ligature the artery above it, but as a rule, even in these circumstances, the operation of choice will be by ligature of the third part of the subclavian, as the dangers and difficulties of the latter operation, when in the hands of a skilled surgeon, are now comparatively small, and the after-results fairly good.

3. *Excision of the Sac.*—This is still regarded as a last resource by the majority of surgeons, but evidence is accumulating in its favour. It should be the method of choice in dealing with large, rapidly increasing aneurysms which are causing œdema and paralysis of the limb.

4. *Matas' Operation.*—If the circulation can be satisfactorily controlled, the Matas operation would be better than excision of the sac.

Brachial Aneurysm.—Compression here is easily performed, and should be fairly tried. For cases at the bend of the elbow, flexion is the method of choice. For those due to traumatism and embolism, excision is the only satisfactory treatment. It is certain that unless prolongation of the operation for any special reason is undesirable, excision of the sac should be followed by blood-vessel grafting.

Aneurysm of a Palmar Vessel.—Compression of the aneurysm and of its arteries of supply, along with elevation of the limb, may first be tried. A splint is to be applied over the extensor surface of the hand and forearm, and pressure pads adjusted over the radial and ulnar arteries and over the tumour. The hand and arm are then slung at a right angle. If this does not succeed, it will be necessary to ligature the radial and ulnar and to compress with pads the interosseous and median arteries, and to elevate the limb. Excision in the palm is difficult, and may occasion irreparable damage to the usefulness of the hand.

Aneurysms of the Lower Extremity.

In this region popliteal aneurysms are the most common. They outnumber those of the femoral artery in the proportion of four to one. Below the popliteal, aneurysms are rare.

Femoral Aneurysm.—Compression treatment by means of elastic bandaging may be tried before operation is resorted to. (*Vide* pp. 46, 47).

If pressure treatment fails, then the Matas operation, ligature of the artery above the aneurysm, or excision of the sac, must be resorted to.

Popliteal Aneurysm.—Pressure and flexion of the knee are methods of treatment frequently successful, and comparatively free from danger. They are therefore deserving of fair recognition. (*Vide* pp. 45–7.) At least 50 per cent of popliteal aneurysms can be cured by pressure.

Ligature of the femoral artery at the apex of Scarpa's triangle is the easiest of the ligature operations for popliteal aneurysm, and it has yielded good results, about 80 per cent of cures having been effected by its means. It seems probable that ligature of the femoral artery in Hunter's canal, or of the popliteal above the aneurysm, might give results even better than these.

Excision of the sac is necessary if the aneurysm is not cured by one or other of the ligature operations above mentioned, or if, after cure, it is the cause of painful contraction symptoms. The Matas operation or excision of the sac is, moreover, the only alternative to amputation when the sac has ruptured. Under suitable surgical conditions, the Matas operation should be done for all popliteal aneurysms.

Gluteal Aneurysm.—It is to be remembered that a gluteal aneurysm, owing to its progressive tendency, always demands active surgical treatment. The most successful method of attack as yet reported has been by the injection of a solution of perchloride of iron (20 per cent) into the sac. This does not seem to have been followed by serious consequences. The injection (50 minims) is introduced at several places, a few drops at each, whilst the sac is compressed laterally. Rest should be enforced for ten days afterwards.

Incision of the sac, arrest of hæmorrhage by finger pressure, and, after the necessary dissection, ligature of the vessel above and below the aneurysm, is an operative procedure which has been successfully carried out. It would be safer to ligature the internal iliac artery, though even this may not succeed.

Abbe did a Matas obliterative operation with success after passing a ligature round

the internal iliac artery to control temporarily the circulation in the aneurysm. It is probable that this is the operation of choice, but the undertaking is a responsible one.

Aneurysm of the Leg and Foot.—These are encountered but rarely. The most satisfactory treatment is by excision of the sac.

Aneurysms of the Neck.

Aneurysm of the Common Carotid Artery.—When the aneurysm is at its most common site, i.e., at the bifurcation of the artery, the surgical methods of treatment available are: (1) *Digital pressure*; (2) *Needling the sac*; (3) *Ligature of the artery below the sac*; (4) *Excision of the sac*; (5) *The Matas operation.* Before one or other of the above operative procedures is selected, the medical measures described in connection with thoracic aneurysm should have been given a fair trial, since they have at least arrested the progress of the aneurysm for a time. Surgical interference should be resorted to only when threatening signs are present.

1. *Pressure.*—Digital pressure on the vessels below the aneurysm and against the soft parts covering the spine is the best form of surgical treatment, but can seldom be brought to a complete conclusion, nor indeed be tolerated in most cases for any protracted period of time. Daily repetitions are necessary, and should be continued for as long as they can be borne. The development of cerebral symptoms, such as loss of consciousness, convulsions, or paralysis, may necessitate abandonment of the procedure. The pressure method of treatment is most likely to be successful with young subjects, and in cases of traumatic aneurysm.

2. *Needling of the Sac* may be used either in addition to the above method (pressure) or as an independent procedure.

3. *Ligature of the Artery below the Sac* has been associated with a high rate of mortality, chiefly in consequence of disturbances in the cerebral circulation, and apart from this has in some cases not cured the aneurysm. It is therefore at the present time an operation not in favour.

4. *Excision of the Sac* is probably less dangerous than ligature of the artery below, and if it can be accomplished the cure of the aneurysm is certain. On these grounds recent surgical opinion is in favour of the operation. It is chiefly indicated in cases of traumatic aneurysm of young people. Before either proximal ligature or excision is undertaken, the circulation in the other carotid artery should be tested. A skilled surgeon could now restore the vessel with a graft after excision of the aneurysm.

5. *The Matas Operation*, i.e., obliteration of the sac by suture, leaving sufficient to transmit blood, may here find a field for usefulness, and, in favourable cases, exclude other forms of treatment.

Aneurysms of the External and Internal Carotid Arteries.—These are treated by ligature of the vessel below the aneurysm, or, if this be not possible, by ligature of the common carotid.

Aneurysm of the Innominate Artery.—Needling and electrolysis have both been used with success. The operation of choice, provided that both common carotids are pervious, is that of simultaneous ligature of the right common carotid and subclavian arteries. It has been followed by good results.

Aneurysm of the Subclavian Artery.—

Of the 1st part.—The treatment is the same as that for innominate aneurysm.

Of the 2nd part.—After failure of medical treatment and of '*needling*', which should have a fair trial, simultaneous ligature of the common carotid and of the subclavian arteries beyond the aneurysm is indicated.

Of the 3rd part.—Direct compression and proximal compression have both been tried, and with some success. Proximal ligature of the first, second, or third part of the subclavian artery may be done; or ligature of the innominate and common carotid arteries; or amputation at the shoulder with high ligature of the artery. All of these operations have failed to cure the aneurysm, and the mortality has been appalling. Excision of the sac has given the best results. In a recent case of leaking subclavian aneurysm, I effected a cure by ligature of the innominate and common carotid arteries, surrounding the ligatured portions with a graft of fascia lata.

Aneurysm of the Vertebral Artery.—In the only reported case, the aneurysm occurred at the lower part of the artery, and the vertebral was tied close to the subclavian and divided. A cure resulted.

Arteriovenous Aneurysm of the Carotid and Jugular Vessels.—Digital compression of the carotid artery below the sac should be fairly tried first. Operative treatment is not to be lightly undertaken, both on account of its inherent danger and in view of the known natural history of these cases. In many of them the swelling remains stationary, and the disturbed cerebral and cephalic circulation ceases to cause the trouble it had originally produced. Severe pressure symptoms and rapid growth are the indications for operation. The artery and vein should be separated and the openings in each closed by suture, or the vessels are to be ligatured above and below the openings and the sac incised and emptied.

Subclavian Arteriovenous Aneurysm.—Treatment is the same as for the previous variety.

Abdominal Aneurysms.

It is to be remembered that in dealing with these cases medical treatment ought first to be given a fair trial. In this connection it is of interest that two cases of cure after the administration of calcium chloride have been recorded.

Pressure on the vessel above the aneurysm may be applied by means of an abdominal tourniquet, and when the aneurysm is not too highly situated may prove successful. The pressure must not be applied for too long a stretch, but is to be repeated from time to time, a due watch being kept meanwhile over the patient's general condition.

Introduction of Wire into the Aneurysm has been the only other method of treatment attended by any success.

Steady diminution of the size of the entering artery by gradually tightened bands or ligatures of metal or of silk has been recently employed with some success; but in favourable cases surgeons, in the near future, will excise the aneurysm and restore the vessel by a graft.

Aneurysms of the Visceral Branches of the Aorta, with the exception of the renal artery, have not yet been brought into the domain of practical surgery.

Aneurysms of the Renal Artery have been successfully extirpated along with the kidney on more than one occasion.

The other vessels, in view of recent improvements in blood-vessel surgery, such as the Matas method of treatment for aneurysm, end-to-end or lateral anastomosis of vessels, and transplantation of vessel grafts, cannot fail to come under surgical treatment in the near future.

Inguinal Aneurysms.—The term is applied to aneurysms of the iliac arteries, though the femoral may be involved. Digital pressure on the artery above may be tried first, and its action may be assisted by compression of the tumour. If pressure treatment fails after a fair but short trial, the Matas operation should be done, or the artery should be *ligatured* above the aneurysm. For ruptured aneurysm, and after failure of the above methods, the Matas operation or excision of the sac is called for. *Rutherford Morison.*

ANEURYSM, THORACIC.—An intimate knowledge of the literature of this subject, together with practical experience of a large number of cases (amounting to several hundreds), compels me to confirm the general opinion that the results of the treatment of aneurysm are eminently unsatisfactory. Nevertheless there is much to be done, and all experienced in the matter will admit that the patient may be benefited in many ways by treatment. Proof of this position is to be found in the records of any large hospital where cases are frequent. Patients introduced into the wards suffering from pain, dyspnœa, distressing cough, etc., leave in a state of comparative comfort, to return in a few weeks, or perhaps months, in much the same condition as at first. Once more they obtain relief; and so the cycle continues, it may be, for several years. It would be a mistake to deny that even cure may occur, but this result is so rare as to be reckoned little more than a possibility.

Treatment.—This is directed to the relief of the symptoms, principally pain,

dyspnœa, cough, and dysphagia ; in securing this we aim also at the reduction in size of the sac, a thickening of its walls, and coagulation of the contents.

It must not be forgotten that some of the symptoms are not necessarily the direct result of the aneurysm, and may depend upon valvular lesion, heart-muscle weakness, or excessive blood-pressure—points that require our closest attention in selecting a plan of treatment. Fortunately, however, drugs and methods adapted to the relief of the aneurysmal symptoms are also suitable, at least in many instances, for treatment of the concomitant heart and circulatory conditions. Iodide of potassium, for example, is an excellent heart tonic ; and we cannot do much better in reducing blood-pressure than insist upon rest, and a lowering diet.

Freedom from worry and excitement is in all cases highly important ; but the fortunate fact that our patients are, as a rule, of a calm and cheerful disposition, though it simplifies in some ways the management of a case, renders it more difficult in others, inasmuch as a patient seldom realizes the gravity of the situation, and is often only with difficulty persuaded to obey instructions.

Rest.—It would perhaps be impossible to over-estimate the value of rest, but the question will naturally arise, Should every case of aneurysm of the arch of the aorta be compelled to rest ? And if exceptions be allowed, what are they ?

Practically speaking, all cases are benefited by rest, but for some few absolute rest is perhaps not essential, this minority consisting of those whose only symptoms are nocturnal pain and consequent sleeplessness. These may be allowed to sit up, and may even take gentle exercise with advantage ; but all alike must be impressed with the necessity of avoiding the exertion of sustained effort. In other words, it is highly important to restrict movements in all cases of thoracic aneurysm.

Diet.—The diet should be carefully selected both as to quantity and quality, and this even in cases in which it is not proposed to carry out the Tufnell plan of treatment. A mixed diet may be allowed, care being taken to avoid an excess of animal food ; indeed, some patients are greatly benefited by a course of milk and farinaceous food alone, and this recommendation is offered notwithstanding the opinion held by many practitioners that the diet should be as dry as possible and highly nitrogenous.

In this connection it may be said that the treatment associated with the name of Tufnell, namely, starvation diet and absolute rest, is worth a trial in some cases, though the patient seldom submits to it for any length of time without protest, nor can it be urged that the results are encouraging enough to warrant coercion. The diet, as is well known, consists of a morning meal of 2 oz. bread-and-butter, with 2 oz. milk or cocoa ; a meal at mid-day of 3 or 4 oz. meat, with 2 or 3 oz. potatoes or bread and 3 or 4 oz. water ; and an evening meal of 2 oz. bread-and-butter and 2 oz. milk or tea. Some cases do badly under this plan, and care must be taken to select suitable ones, for the broken-down syphilitic patient, or the man with aortic regurgitation and failing compensation, should not be subjected to the risk. A modified Tufnell diet, however, in conjunction with rest and iodide of potassium, constitutes the plan of treatment on which our best reliance is to be placed.

Drugs.—The most useful drug in the treatment of aneurysm is undoubtedly iodide of potassium, which is generally supposed to have been first employed for this purpose by Bouillaud. In conjunction with rest and diet, it leaves little to be desired as a means of relieving pain. It relieves all varieties of the pain associated with aneurysm, but especially for the true aneurysmal pain which is worse at night and is relieved by change of posture it is almost a specific. The dose should be large, but 15 to 20 gr. three or four times a day is generally sufficient, though in some cases relief is obtained only by the use of a considerably larger daily amount, and some authorities recommend as much as 1 drachm for a dose. Occasionally the pulse is accelerated by the use of iodide, but this is of little importance, and does not interfere with the beneficial action of the remedy.

As a rule a few days elapse before any improvement is noticeable, and some patients are unable to bear the necessary dose. When this happens it is well to withdraw the iodide of potassium and substitute the strontium salt in its place. It is unnecessary here to discuss the action of this salt further than to say that it seems to relieve pain, lower blood-pressure, act favourably on heart muscle, aid formation of clot, reduce the size of the sac, and thicken its walls.

The treatment should be persevered in for six or eight weeks at a time, and rest and diet certainly increase the usefulness of the remedy.

Notwithstanding the close connection between syphilis and thoracic aneurysm, it would not be advisable to employ salvarsan, even in cases in which a positive Wassermann reaction has been obtained.

Operative Measures.—The results of distal ligature in the treatment of aortic aneurysm have not been encouraging, though the cases recorded by Heath, Barwell, and others, as treated by this method, would seem to suggest that we are not justified in excluding our surgical friends from some say in the matter.

Extreme dyspnœa, amounting at times to threatened suffocation, generally associated with congestion and blueness of the head and neck, may be benefited by venesection ; and chloroform has often given relief. The operation of laryngotomy is intensely disappointing in its results, for the simple reason that the obstruction is generally below the larynx and rarely due to bilateral abductor paralysis. In two cases, when death seemed imminent from suffocation, and tracheotomy was performed without relief, as the trachea was compressed at the bifurcation, the threatened danger was averted by inhalation of nitrite of amyl ; but the relief was, of course, only temporary.

Electrolysis.—Galvano-puncture or electrolysis was recommended many years ago for the treatment of thoracic aneurysm. It consists of the introduction into the sac of two insulated needles, bare at the points, by which means a galvanic current is passed through its contents. The object of this proceeding is, of course, to induce coagulation of the blood in the sac about the positive needle, and care must be taken that the points are not allowed to touch. Indeed, it would seem to be unnecessary to introduce more than the needle connected with the positive pole, for the circuit can be closed by the application of the negative pole through the medium of a large surface rheophore to the skin close to the sac. In the few cases I have treated by galvano-puncture the results were not satisfactory enough to encourage further attempts, and this would seem to accord with the general experience. A reference to the literature of this part of the subject will, I think, convince the reader that most of the cases in which benefit has been claimed from this plan of treatment would probably have done as well with some other less heroic means ; and in not a few it has hastened a fatal termination.

Another form of treatment having the same object, and associated with the names of Moore and Loreta, is the introduction into the sac of foreign material, such as wire, silk, horsehair, or catgut. Personally, I have no experience of this plan, and am not favourably impressed by the published results. The electrolytic method in conjunction with the introduction of fine iron or gold wire has also been tried, and in a few cases successful results have been claimed.

Internal Irritation of the Walls.—In 1890 Macewen advocated a plan for inducing the formation of white thrombi in the sac of an aneurysm by irritating the internal surface with the point of a needle. I subjoin Macewen's description of his method : " Before performing the operation the skin over the aneurysm ought to be carefully cleansed and rendered aseptic. The aseptic pin ought then to penetrate the sac and pass through its cavity, until it comes in contact with the opposite side. It ought to touch and no more. Then one of two methods may be employed : either to move the pin over the surface of the inner wall so as to irritate its surface, or to allow the impulse of the blood-current playing on the very thin pin to effect the same object. If the wall penetrated by the pin on introduction be dense, the former method will be preferable, as the force of the blood-current produces such a feeble action on the thin pin as to be insufficient to move it to and fro whilst it is firmly grasped by the dense wall. After acting thus for ten minutes at one part, the point of the pin, without being removed from the sac, ought to be shifted to another spot, and so on until the greater portion of the internal surface opposite the point of entrance has been touched ; this ought to be done in a methodical manner. A single insertion of the pin through the aneurysmal sac into its interior may be sufficient to enable the point of the instrument to come into contact with the greater part of its internal surface, but in some cases puncture from various sides of the external wall may be necessary so as to reach portions of the tumour which cannot be attacked from the first puncture " (*Lancet*, Nov. 22, 1890). The period for which the pin has been kept in the sac has varied between a few minutes and many hours, but forty-eight hours is given as the limit of safety.

Only a limited trial has apparently been made of this plan of treatment in cases of thoracic aneurysm, and I confess I have been deterred by the fear of displacing clot that might already line the sac. All practical physicians recognize also the enormous difficulty presented at times in distinguishing between sacculated and fusiform aneurysms.

A somewhat similar procedure was introduced in Paris in 1888, when Dr. Constantin Paul advocated the introduction of a number of long and very fine needles into the sac, to be left there for a few minutes with a view to setting up a slight degree of adhesive inflammation—the operation to be repeated in a few days at another part of the sac. Paul contended that this results in thickening of the walls, and possibly this plan would commend itself to some in preference to Macewen's; but it is obvious that both are more suitable for aneurysms of smaller vessels than for those of the aorta.

Injection of Gelatin.—Based upon the observations of Dastre in 1895, that the injection of a solution of gelatin into the veins of a dog favoured coagulation of the blood, Lancereaux proposed the employment of a similar solution in the treatment of aneurysm. Since then many cases have been treated by gelatin injection, and some with surprising results. In his earlier cases, Lancereaux employed a 2 per cent sterilized solution of purified white gelatin, of which he used 4 or 5 oz. (introducing the needle deeply into the subcutaneous structures, buttock, axilla, etc.); but later he reduced the strength to 1 per cent, and advocated the injection of 9 or 10 oz. of the solution, repeating the operation every three or four days until eighteen or twenty injections were made. In some of my own cases I have employed as strong a solution as 4 per cent, of which 1 oz. or rather more was injected, and repeated every three or four days according to the state of the patient; but the weaker solution is probably safer, and seems to do as well.

This plan of treatment appears to be most useful in cases in which a false sac has become established outside the bony structure of the chest, with threatened perforation; but it is evident that the treatment must be subjected to a much more extended trial at the hands of skilled observers, and under conditions free from risk, before a definite decision can be arrived at as to its general utility. Undoubtedly in some cases the injection of a gelatin solution does induce coagulation of the blood in the sac. In one very striking case of my own there was a pulsating sac the size of a large orange, pointing to right of sternum above the fourth ribs, and covered by shining skin of purple colour. Five injections were made into axillæ and beneath adjacent pectoral muscles at intervals of two or three days; after the first, a distinct change was noticed in the contents of the sac; after the fifth it ceased to pulsate, and became as hard as a cricket ball, being also reduced in size. But another of my patients developed tetanus after the ninth injection, which was the more unfortunate as otherwise the case seemed to be doing well.

In fact it should be recognized that in this agent we clearly have a remedy that is powerful for good or evil. It may perhaps come to be regarded as a medicinal factor in the treatment of aneurysm, second only in importance to iodide of potassium; but at present the gelatin treatment is attended by considerable risk, and very few practitioners who have given the plan an extended trial have succeeded in avoiding some untoward result. The chief danger seems to lie in the fact that commercial gelatin is apt to contain the tetanus bacillus, and the difficulties in sterilizing the solution are very great, as the properties of gelatin are destroyed when the temperature is raised beyond a certain point. It is hoped, however, that this difficulty may soon be overcome, so that the treatment may be undertaken in suitable cases without undue risk to the patient.

Narcotics.—When pain defies rest, diet, and iodide of potassium, it may be relieved by morphia; and without doubt the hypodermic syringe is the best method for its administration.

The troublesome symptom of irritating cough may, in some cases, be aggravated by iodide on account of its tendency to increase bronchial secretion. These are nearly always cases of aneurysm of the transverse arch, in which the sac presses upon the lower part of the trachea. As a rule the iodide, with rest, will give relief by reducing pressure; but where the sac is intimately incorporated with the trachea, and the secretion is copious and expelled with difficulty, the drug may fail. Here small doses of morphia, with soothing inhalations such as menthol, conium, or Friar's balsam, may afford relief; but the administration of the sedative must be watched with care on account of the respiratory difficulty.

David Drummond.

ANGEIOMATA.—These tumours require treatment when (1) They are obvious disfigurements; (2) They are increasing in size; (3) They have become inflamed or ulcerated, with the associated risk of hæmorrhage. If a nævus is small, is not upon an exposed area of the body, and is not increasing in size, no treatment is required. Some of them disappear spontaneously.

The aim of all treatment is to remove them so as to leave only the slightest trace of their former presence, and this is best attained by means of excision. In most instances this can be done. In certain situations, such as the scalp, it is imperative, since destruction of the nævus *in situ* without removal will leave an area that will always be devoid of hair. The simplest procedure is to enclose a fusiform area in which the nævus is situated by two incisions, which must be just free from the margin of the tumour all round. One apex of the enclosed area is seized by toothed forceps, and the tumour can then be peeled off rapidly by traction, aided by a few touches of a scalpel. By this means the free hæmorrhage that is frequently regarded as the necessary accompaniment to the removal of a nævus is almost entirely avoided—a consideration of the utmost importance when such a tumour requires removal from the scalp of an infant.

This procedure must be modified for the treatment of nævi occurring in certain situations such as the orbit, the nose and mouth, the lips, the external genitalia, and the circum-anal region. A nævus in the orbit which has given rise to proptosis must be removed by piecemeal dissection with two pairs of dissecting forceps through an incision in the eyelid. All injury to the rest of the structures in the orbit is thus avoided, since the nævus tissue shells out easily. A combination of methods must be employed for the removal of a large cavernous nævus from the lips, which frequently appear as large pendulous shapeless masses. Make a small vertical incision into the lip, and through the opening thrust the fine needles of a galvano-cautery into the centre of the tumour. The needles must not be heated until they have been introduced; otherwise the edges of the incision will be charred. Having burnt away some of the nævoid tissue, allow the needles to cool, and then withdraw them. Stitch up the incision with fine silkworm-gut sutures. By a frequent repetition of these measures the whole of the nævus can be destroyed with very slight disfigurement to the lip. If the growth encroaches upon the surface of the gums, palate, or mucous membrane of the nose, the free edge must be immediately destroyed by cauterization to prevent its spreading to regions inaccessible to treatment. For a nævus in the genitalia or circum-anal region, a combination method of excision and cautery or electrolysis is the most valuable. Nævi in the region of the parotid gland often grow to a formidable size, and their removal may be complicated by the branches of the facial nerve running through them. The skin over the whole tumour should be turned forwards as a flap by a curvilinear incision in the region of the angle of the jaw. When the tumour has thus been exposed it is removed by blunt dissection with dissecting forceps. The nævus is seized in the forceps and removed piecemeal by gentle tearing, the direction of the tear always being made along the lines of the branches of the facial nerve. The latter are thus easily exposed, and permanent injury is only likely to result to them from careless or too forcible tearing. When the piecemeal dissection has been properly carried out, any slight facial weakness from the stretching of the nerve-fibres that may sometimes ensue is of a purely temporary character and undergoes a rapid spontaneous recovery.

When, from consideration of the situation and size of the nævus, excision or any of the foregoing combined methods appear to be impracticable, other means of treatment must be adopted. The essential process underlying these other methods is the production of necrosis of the nævoid tissue. A large number have been devised, but only four of them can be considered of real value—cauterization, electrolysis, radium, and freezing by carbon dioxide snow. Cauterization is the more rapid way; radium is slow and requires many exposures; electrolysis and CO_2 snow leave less ultimate scarring. The two first-named processes can be carried out by means of fine needles attached through a resistance board either to a main or to a storage battery. For electrolysis a current of 10 to 20 ma. is sufficient and safe. Either the negative or positive needle, or both, may be inserted into the tumour. The negative needle has the advantage of destroying the tissue more rapidly than the positive, and the evolution of hydrogen can be used to gauge the amount of destruction that has been done at each operation.

There is no such indication when the positive pole is used, and although this is said to yield a firmer thrombus, it has the additional disadvantage of staining the tissues brown by a deposit of iron from the needle. Blanching of the tissues by hydrogen must not be induced to an extent likely to cause sloughing at the surface, since a deep permanent scar will be the result. For fine capillary nævi on the face, a few pricks by the negative pole are generally sufficient to avoid all disfigurement. CO_2 snow has no specific or selective action upon angeiomatous tissue, but by producing a 'frost-bite', leading to sloughing, the mass is destroyed. The residual scarring is very slight, and the method is of great value where the resulting disfigurement is in an always visible position. It is used as follows: Liquid CO_2 is allowed to escape from the storage cylinder with such rapidity that it immediately solidifies. The crumbling snowy mass is collected in a cone of 'wash-leather', and thence transferred to a hollow metal rod. A wooden stick is then thrust into the rod, and with the latter resting upon a table by one end, the contained snow is welded into a firm mass by blows of a hammer upon the end of the stick. The snow is then extruded in a condition fit for use. It is applied to the surface of the nævus for a varying length of time—from 5 to 30 seconds—and with a varying pressure, according to the thickness of the tumour. The frozen surface is then protected by a dressing of bismuth ointment spread upon sterilized gauze, until healing is completed. For a large nævus the process may have to be repeated several times. An anæsthetic is advisable for a long exposure with deep pressure, as there is considerable pain at the time of application. (*See also* CARBONIC ACID SNOW.)

When a nævus has been destroyed by these methods and the resulting fibrous tissue has been allowed to shrink, a further improvement can frequently be effected by excision of the fibrous mass. It is hardly necessary to add that all these operations must be carried out under conditions of the most scrupulous surgical cleanliness. (*See also* ELECTROTHERAPEUTICS.)

George E. Waugh.

ANGEIONEUROTIC ŒDEMA.—(*See* URTICARIA.)

ANGINA LUDOVICI.—This is a cellulitis which commences in the neighbourhood of the submaxillary gland and tends to spread in the deep fascial planes of the neck towards the mediastinum. The infection may gain entrance through the tonsils and spread thence to the deep cervical lymphatic glands, and so to the submaxillary area, or it may originate from oral sepsis, draining directly into the submaxillary lymphatics. It produces a severe toxæmia generally, and an intense œdema of the floor of the mouth locally. This œdema tends to spread to the epiglottis and larynx, producing limitation of the movements of mastication and consequent oral stagnation and sepsis.

TREATMENT.—It is essential that the general toxæmia should be early treated by salines and saline purgatives, and the patient's general condition supported throughout the course of the disease. The hygiene of the mouth should be regularly attended to by swabbing and irrigation. The local condition should be treated with fomentations in the early stages, with a careful outlook for any incipient signs of laryngeal obstruction—the greatest danger of this disease. Should the cellulitis be progressing, it may be necessary to make multiple incisions, carried down through the deep fascia, to lessen the pressure from œdema and improve the local circulation. If possible, this should be done under local anæsthesia, as, owing to the presence of œdema of the fauces, the administration of a general anæsthetic is attended with considerable risk. If an anæsthetic has to be given, chloroform alone should be used. It is rare to obtain pus by these multiple incisions; bleeding will be free, but may be controlled by plugging with gauze. Fomentations should be continued after a short interval to allow the hæmorrhage to cease. As the condition subsides, the discharge from these incisions will become more abundant, and finally purulent with the separation of sloughs.

Should dyspnœa become urgent, tracheotomy should be performed above the isthmus of the thyroid, an operation which, owing to the swelling of the subcutaneous tissues, is often one of considerable difficulty. Intubation is not advisable owing to the difficulty of opening the mouth. If the organism—usually a streptococcus—can be isolated, a vaccine should be prepared, so that treatment by inoculation can be commenced as soon as possible.

Albert J. Walton.
(*Revised by E. C. Lindsay.*)

ANGINA PECTORIS.—Treatment may be divided into two parts: (1) The direct treatment of the paroxysms; and (2) Treatment in the interparoxysmal periods.

In the great majority of cases that prove directly fatal, angina pectoris is known to be associated with disease in one form or another of the coronary arteries. The disease, however, regarding it as a clinical entity, may be met with apart from any lesion of the coronaries: so much must be admitted. In rare cases of mitral stenosis it is thus met with; death in these cases does not result from the angina (in the writer's experience), but from the ordinary disturbance of the circulation wrought by the valve lesion. Moreover, in the disease associated with coronary changes, it sometimes happens that the angina pectoris subsides, while the symptoms and signs of cardiac muscle failure develop, and run their ordinary course to a lethal termination. Many cases of angina pectoris, *but not all*, are associated, moreover, with habitual high, or fairly high, arterial tension. This condition becomes intensified during the paroxysm: whether as cause or effect has been matter of controversy. It is found that remedies which dilate the arterioles, and so lower blood-pressure, at the same time relieve the pain of angina. It is not necessary, however, that the blood-pressure should be high in order that the paroxysm may be relieved by vasodilators—probably the condition of the heart and the relationship of its contractile power to the burden imposed on it have to be considered in such cases. and vasodilators will still lighten the burden of the heart in the presence of quite low tension. However this may be, the *trial* of vasodilators must not be limited to cases associated with high arterial tension.

1. **Treatment of the Paroxysms.**—It is usual to begin the treatment of the paroxysm with the inhalation of nitrite of amyl, and such inhalation often gives an indication of the effects likely to be obtained from the vasodilator class of drugs. It is best to give the patient, who is found to obtain relief from amyl inhalation, a box of small glass phials containing the drug, each wrapped up in linen. When he feels the onset of an attack he takes out one of these so-called 'capsules', breaks it between his finger and thumb, and holds it to his nostrils for inhalation. The 'capsule' may be held in a handkerchief, so that nothing unusual is observed by bystanders, should it be necessary to apply the remedy in public.

A considerable number of nitrites are in use for internal and more or less regular use: liquor ethyl nitritis, sodii nitris, liquor nitroglycerini or trinitrini or glonoini, or tabellæ nitroglycerini (chocolate excipient), or tabloids of erythroltetranitrate. Erythroltetranitrate is believed to keep up its effects for a longer time than do the others, and tabloids are made containing respectively three strengths: $\frac{1}{4}$, $\frac{1}{2}$, and 1 gr. Even in the case of the last the difficulty of maintaining the action of the drug is great. It is often advisable to anticipate paroxysms that occur in the night by giving a full dose of a vasodilator at bedtime. Alcohol is essentially a vasodilator, and its good effects in the paroxysm of angina pectoris were long ago recognized. A glass, or less, of whisky or brandy taken in hot water at bedtime, will often ward off a nocturnal seizure.

Diffusible stimulants, diluted for immediate use in camphor water or the like—spiritus ammoniæ aromaticus; spiritus ætheris, spiritus chloroformi, etc.—singly or in combination, are generally useful in the paroxysm, and often promote that much-desired effect, the eructation of 'wind', which seems often to end the attack, whether the result be *propter hoc* or merely, as is probable, *post hoc*.

In the classic case of Dr. Arnold, of Rugby, it is related that Dr. Bucknill gave brandy and laudanum to the patient, and a better combination at the time could hardly have been devised—the brandy as a vasodilator, the laudanum as an anodyne. To-day, we give nitrites in place of alcohol, and a hypodermic injection of morphine in place of laudanum by the mouth. Moreover, in order to mitigate the disagreeable after-effects of morphine that occur in many subjects, we combine the drug with atropine, which, like strychnine, is a respiratory stimulant. Hypodermic injection of morphine by the attendant is an immense improvement, inasmuch as it obviates the possible tendency to too frequent resort to the remedy by the patient himself, and the stomach and intestines are very much less disturbed by it than they are when opium in any form is taken by the mouth. There are some patients, however, who suffer from severe sickness and inability to take nourishment after morphine has been given even hypodermically, and guarded, as it were, by atropine. Fortunately, such cases are very rare, for their treatment is one of the greatest difficulty when nitrites fail to relieve, and, indeed, nitrites seldom continue to effect complete relief to the end of a case. No general rule can be given, but by experiment—altering the proportion of atropine and diminishing the morphine—a dose of the two alkaloids may be arrived at that will give

relief without the production of sickness. In all cases of the disease, when it becomes necessary to give morphine, the dose should be very small at first, and it is the invariable practice of the writer to combine it with atropine. It is easy and safe to increase the dose gradually, when once the individual tolerance of the drug is known. To give even $\frac{1}{4}$ gr. of morphine without any knowledge of the idiosyncrasy of the patient, and especially without knowing whether or not he is the subject of seriously diseased kidneys, is always a risk. Much bronchitis, again, with a tendency to accumulation of secretion in the tubes, is quite as strong a contra-indication as regards the use of morphine as is Bright's disease. Beginning with infinitesimal doses, and combining the morphine with atropine, it is usually possible so to administer the drug that its beneficial effects are exerted without safety being compromised.

Very exceptionally it may be necessary to have resort to the inhalation of chloroform, and there is good evidence of the occasional value of the treatment. When morphine has already been given with only partial success, inhalation of a very small quantity of chloroform may accomplish complete relief for a considerable period, promoting the action of the morphine.

2. **Treatment in the Inter-paroxysmal Periods.**—It is all important, in the first place, that the patient should lead a regular, quiet life, and that he should especially avoid circumstances likely to expose him to *physical exertion* and *mental emotion*. The rush up a short stair to catch a train at a railway station, the transient loss of his temper, may cost him his life. Walking against a strong and cold wind is peculiarly apt to bring on a seizure, as is going out from a warm room into cold open air. Tobacco smoking must be indulged in with moderation. It is well known that symptoms like those of angina pectoris occur in persons who smoke to excess.

The dietary of the subject of angina pectoris perhaps comes next in importance to tranquillity of life. The evil effects of tympanitic distention of the abdomen cannot be denied ; it is admitted by nearly all sufferers from the disease. It is known that starchy food is the great promoter of tympanites, and practical experience and experiment will soon convince any one of the fact. Flesh-food, again, favours the contractile vigour of the heart-muscle along with the musculature of the body generally, and the heart-muscle is apt to be ill-nourished in the disease. No fear need be entertained, on the one hand, that excess of flesh-food will induce ' excess of uric acid ' and all that faulty metabolism which such a state connotes, *provided carbohydrates are at the same time cut down to a minimum*. The writer, on the other hand, has no fear of letting the patient have with his flesh-food, which taken alone seems to lack the property of affording the feeling of repletion, *green* vegetables, thoroughly cooked, and best squeezed through a sieve. These aid the maintenance of free action of the bowels, an important detail of treatment. No doubt satiety and lethargy are experienced by the carnivora after feeding, but they, as a rule, have one meal in twenty-four hours, which, thus, must be a large one. Let the reader, however, contrast the belly development of the lithe carnivora with that of the slow, though it may be powerful, herbivora. Though any large quantity of fat in the diet of the subject of angina pectoris is to be deprecated, it is probable that the patient whose carbohydrate food is cut down to a minimum may be allowed a fair amount thereof, should his inclination lie in that direction. To simplify the digestive processes, the writer recommends that breakfast should be made the bread or carbohydrate meal of the day. The bread is best taken in the form of thin crisp toast, buttered cold, its crispness promoting mastication and thorough mixing with saliva. *China* tea should be used, or weak coffee ; cream may be allowed therewith. Fruit is probably best taken with or after breakfast, and its inclusion in the dietary is wholly beneficial in most cases. The midday meal should consist of some sort of flesh-food plainly cooked, with green vegetables, as already recommended. One kind or another of green vegetable is to be obtained all the year round, but occasionally such a vegetable as turnip (with 5 per cent of carbohydrate in the form of pectose) may be allowed, for the patient after a time longs for an occasional change. Carrots, on the other hand, cannot be allowed, owing to the large amount of carbohydrate they contain (10 per cent of sugar).

The evening meal, again, may be begun with a *small* quantity of *consommé*—for such promotes digestion—but no rich 'thickened' soup on any account. Flesh-food follows, and fish, joint, or bird may be allowed. No large number of courses, however, is to be

recommended. Custard, or junket and cream, should be permitted only when *one* flesh-course has been taken. The less fluid drunk with the meal the better, and on no account should large draughts be taken. It is the writer's experience that when carbohydrates are reduced to a minimum, patients have no desire to drink much. It is probably better to make the midday meal the more substantial, reversing the custom of a heavy evening meal.

For the sufferer from angina pectoris, it is certainly important to rest after each meal. Great risk may be incurred by neglect of this rule, and this risk is greater if the meal has been a 'mixed' one, like the luncheon and dinner of ordinary society. In the case of the poor, no less care must be taken with regard to the dietary, and the difficulties to be overcome are much greater; but with a knowledge of the composition and price of different foodstuffs they can be overcome. Excessive bread-eating, inasmuch as bread is a cheap food, offers the greatest difficulty in the case of the poor: on the other hand, the small quantity of flesh-food usually obtained by them is perhaps a saving fact under the circumstances.

The *Medicinal Treatment during the Inter-paroxysmal Period* should be directed against constipation, dyspepsia (essentially treated by dietetics), insomnia, and other disorders calculated to promote a seizure of angina. An excellent mixture for the relief of constipation and dyspepsia is 20 gr. of compound rhubarb powder suspended in an ounce of peppermint water and taken three times daily. Ten grains may suffice for the dose. As regards pure insomnia, chloral is often useful, unless there be great feebleness of the heart. It acts on the arterioles as a vasodilator, but also as a depressor of the vigour of the heart-muscle. ℞ Paraldehyde is safer, and whenever there is an element of dyspnœa or threatening of angina associated with the insomnia, a hypodermic injection of morphine and atropine is best. Arsenic has long been in use in the treatment of angina pectoris. It is usefully given in the form of liquor arsenici hydrochloricus, combined with liquor strychninæ, 4 or 5 min. of each in ½ or 1 oz. of water taken after meals. When there is any tendency to nocturnal attacks, a tabloid of erythroltetranitrate, ½ or 1 gr., may be taken each night at bedtime in anticipation of an attack.

Iodide of potassium is often recommended in arterial degeneration, but probably to be efficient the drug must be employed earlier than is usually the case. While the writer has perhaps too low an estimate of the value of the drug, a course of it is always safe, and may prove beneficial between the paroxysms of angina pectoris. Its tendency is to lower arterial tension. Its use might seem specially indicated in cases of syphilitic aortitis associated with angina pectoris and narrowing of the coronary orifices. The writer has repeatedly used it in such cases, but has never witnessed what may be termed a 'specific' result. As far as the relief or removal of symptoms goes, he has never seen any result approaching in success that commonly witnessed from the administration of the drug in cases of intrathoracic aneurysm. It seems almost idle to expect that a narrowed coronary orifice or artery will be again reopened to its normal size or anything approaching it. The removal of a gummatous neoplasm is the most that can be hoped for.

Graham Steell.

ANKYLOSIS OF JOINTS.—The causes of ankylosis may be extra-articular (false ankylosis), or within the joint (true ankylosis).

False ankylosis may be due to: (1) Peri-articular adhesion; (2) Spasm of muscles from disease in the joint, or from hysteria; (3) Myositis ossificans.

True ankylosis may be either fibrous or bony.

True fibrous ankylosis may be due to: (1) Acute suppuration; (2) Infection with various organisms, e.g., gonorrhœa, tubercle, influenza, rheumatism; (3) Trauma. Fibrous ankylosis is sometimes divided clinically into sound and unsound; the terms indicating whether the cause of the stiffness is quiescent or not.

True bony ankylosis may be due to: (1) Suppuration in the joint, with destruction of cartilage; (2) Acute infection, with no suppuration.

Peripheral bony ankylosis is the description given to stiffness due to interlocking of osteophytes in osteo-arthritis.

Congenital ankylosis is also met with. The commonest example is at the upper radio-ulnar joint. The ankylosis is bony, usually bilateral, there is no secondary wasting of muscles, and the upper end of the radius can be excised with no fear that the operation will produce deficient growth in the radius. A flap of fascia may be interposed to prevent

reunion ; but the results of operative treatment on these lines are disappointing, owing to a constant curve of the radius preventing full supination.

True congenital ankylosis of the shoulder is rare, the limitation of movement at this joint in a child usually being due to either congenital elevation of the scapula or to the after-results of a neglected Erb's palsy.

Other joints may be stiff from intra-uterine epiphysitis, or from infection at a very early age with the pneumococcus or gonococcus.

Diagnosis.—The joint being stiff, every care should be used in attempting movement, the dangers being : (1) A fresh outbreak of inflammation ; (2) Dislocation, some shortened ligament acting as a fulcrum ; (3) Injury to large vessels and nerves which have become structurally shortened in the concavity of a flexed joint ; (4) Fracture of a bone near the joint, these bones being nearly always atrophied, and more likely to give rise to fat embolism. In bony ankylosis there is no movement and no pain, points of great value in separating it from a fibrous ankylosis.

Differential diagnosis is especially difficult in the shoulder, where a bony ankylosis may be diagnosed as fibrous owing to the free mobility of the scapula. In the hip, a fibrous ankylosis may be diagnosed as bony, because the joint is surrounded by strong thick muscles. Before proceeding to treatment, every ankylosed joint should be *x*-rayed, and then the ankylosis determined. If there still be doubt, examination under an anæsthetic may reveal slight movement. In fibrous ankylosis there is movement, however little, and usually it produces some pain.

It is important to distinguish true ankylosis from false ankylosis due to peri-articular adhesions. The points in favour of the latter are : (1) The history is short, and one of trauma or of slight inflammation ; (2) Movement is limited, it is true, but within these limits there is no stiffness or crepitus ; (3) With gentle manipulation under an anæsthetic, the adhesions can be felt to snap, and at once free movement is possible. The sensation is quite different from the gradual and continuous grating sensation given to the hand of the operator as intra-articular adhesions are broken down.

In true fibrous ankylosis it is difficult to estimate the condition. There may be : (1) Thickening of the capsule ; (2) Adhesions of the capsule and synovial membrane in folds or recesses ; (3) Bands in the joint ; (4) Fibrous tissue between the bone ends.

Points in favour of extensive involvement are : (1) The history is long, and of subacute or acute inflammation ; (2) Under an anæsthetic the limitation of movement is rigid.

Myositis ossificans should be suspected as a cause of stiffness after injury, especially in the case of the knee- and elbow-joints.

Treatment. — This may be considered under the headings of : (1) Prevention ; (2) The treatment of fibrous ankylosis ; (3) The treatment of bony ankylosis.

1. **Prevention.**—The treatment differs according as the joint inflammation is : (*a*) *Tuberculous ;* (*b*) *Traumatic ;* (*c*) *Due to infection* with an organism other than tubercle.

a. Tuberculous.—The most reliable proof that the inflammation in a joint is due to the tubercle bacillus is a positive complement-fixation reaction.

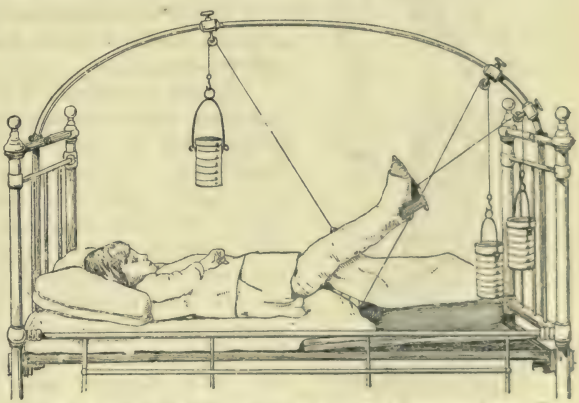


Fig. 1.—Method of straightening an inflamed tuberculous knee. One extension pulls in the line of the tibia, a second pulls the leg forward, a third pulls the femur backward.

To prevent ankylosis the best treatment is :—

i. Reduce the deformity by extension in the line thereof. The object of extension is to relax the muscles which were in spasm. It must be in the line of the deformity (*Fig.* 1). If pain recurs after being temporarily relieved by extension, the most likely cause is that the extension is now too great, the pull coming direct on the capsule of the joint now that the muscle spasm has passed off.

ii. Having got the joint into the most serviceable position, fix it for twelve months after all pain has disappeared. The rigid fixation of the joint prevents ankylosis, because ultimate ankylosis in a tuberculous joint is due to fibrous tissue. The fibrous tissue is preceded by granulation tissue ; the best method, therefore, of preventing the formation of fibrous tissue is by rigid fixation to allay the inflammation and consequent formation of granulation tissue.

iii. Systemic treatment—e.g., sunshine, cod-liver oil, tuberculin.

b. Traumatic.—To prevent ankylosis, start massage and passive movements early. The test that the joint is progressing satisfactorily is that there must be a daily increase in the amount of passive movement possible.

c. Infective.—Every attempt must be made to find the primary focus of infection and remove it, the treatment being supplemented by vaccines. In addition to this, for acutely-inflamed infective joints—e.g., due to gonococcus, staphylococcus, etc.—what is known as the Murphy treatment gives excellent results. The essentials of the treatment are :—

i. Injection into the joint of 2 per cent formalin in glycerin. The formalin injection produces a polymorpholeucocytosis, not only in the joint but also systemically, and so prepares for resistance against the invasion of the organism. Turpentine is more efficacious in producing such a leucocytosis, but practically we cannot get a solution of turpentine (Venice), or a suspension, in such minute particles as to avoid the risk of phlyctenular necroses in the synovial membrane. Risk is present even with 2 per cent formalin in glycerin, but if the 'solution' be over twenty-four hours old, there is no real risk of this. The mixture is thick, and has to be inserted with a special pressure-screw syringe. The immediate result is an increase of pain and swelling in the joint for twenty-four hours. At the end of forty-eight hours the patient is relieved of his pain. The injection is repeated at the end of a week, and, a week later, movements are commenced.

ii. Extension. In the intervals of the above, powerful extension is kept up on the joint.

2. **Treatment of Fibrous Ankylosis.**—If the adhesions are extra-articular, excellent results can be obtained by movement under an anæsthetic—so breaking down the adhesions—supplemented by early massage, and active and passive movement.



Fig. 2.—Type of apparatus used to straighten a fibrous ankylosis of the knee following tuberculosis.

If the adhesions are intra-articular, no treatment is advisable in the way of breaking them down or stretching them, unless the joint is quite cool. In other words, the ankylosis must be clinically sound.

If the adhesions have followed an infective arthritis the primary focus of which has not been removed, this latter must still be done.

In the treatment of fibrous ankylosis following trauma, or infection which is non-tuberculous, I have found it of very little value to attempt breaking down adhesions under an anæsthetic. The ultimate results may be a joint more fixed than before, apart from the risks of forcible movement described above. Forcible movement to place the limb in a more serviceable position is, of course, subject to the same risks, but in non-tuberculous cases it is justifiable. Personally, I prefer to do either an osteotomy close to the joint or an arthroplasty, using a flap of fascia and fat to prevent reunion of the bones. I have never seen any benefit from fibrolysin or from cataphoresis with chlorine ions, unless these two treatments were supplemented by massage and passive movement. Although, in my opinion, the sudden correction of deformity is justifiable, the risks are certainly great. I therefore suggest, as an alternative, either osteotomy, arthroplasty, or gradual extension.

The gradual extension may be applied in bed on the same principles as in the correction of early deformities ; or it may be applied in a Hessing's apparatus, leather casings being moulded accurately to the limb above and below the joint, and these connected by elastic or spring traction (*Fig.* 2). If on examination under an anæsthetic the adhesions

are apparently slight, massage and passive movements will produce a comparatively movable joint ; but I am sure that it is unwise to attempt repeated manipulations under an anæsthetic if the adhesions are at all strong.

If intra-articular adhesions have formed in an old tuberculous joint, the patient, in the present state of our knowledge, must be content to remain with a stiff joint. We can improve its position by gradual extension (*Fig.* 2) or by osteotomy, but arthroplasty is not recommended ; and, as far as we can judge, the danger of lighting old tuberculous mischief by forcible movement is greater than the disability of the average stiff joint.

3. **Treatment of Bony Ankylosis.**—Here, again, we must be sure that the ankylosis is sound. If sinuses are present, any dead bone must be removed, and the sinuses must be induced to heal by scraping, vaccination, etc. The treatment of a sound bony ankylosis depends partly on the joint and partly on its position—e.g., an ankylosed hip in a young person is compensated by an increased mobility of the lumbar spine ; but an elbow ankylosed in an extended position, or an ankylosis of the temporomaxillary joint, is a severe disability, and must be remedied.

In the case of bony ankylosis of one elbow, the temporomaxillary joint, or both hips, the best treatment is an arthroplasty, performed by reshaping the bone ends, and interposing between them either a flap of fascia and fat, or a piece of Baer's membrane (sterilized, chromicized pig's bladder).

If one hip be ankylosed in a position giving apparent shortening, the best treatment is a subtrochanteric osteotomy, division of the adductor longus tendon close to the pubic spine, and a plaster casing, applied with the thigh in a slightly abducted position.

In the case of the shoulder, the average patient would be wise to leave it as it is. An increased range of abduction may be secured by an osteotomy at the upper end of the humerus and fixation in an abducted position. When union occurs, the elbow will be carried at the side by the angle of the scapula being pushed to the middle line. When the patient rotates the scapula forwards by the serratus magnus, the arm will be abducted through an angle of almost 90°.

In a bony ankylosis of the knee, due to the patella being tethered to the femur, arthroplasty to that extent is justifiable ; but if there be bony ankylosis between the femur and tibia, the best treatment is simply to correct deformity. In adults this is done by cuneiform osteotomy ; in children it is done by curvilinear osteotomy, to avoid the epiphyseal lines. Before fixing the limb on a splint, the operator must be certain that there is no pressure on the popliteal vessels.

If the ankle be ankylosed in a bad position, the astragalus must be excised.

In bony ankylosis of the elbow, I believe arthroplasty is superior to excision.

Robert Milne.

ANKYLOSTOMIASIS.—(*See* Anæmia, Tropical.)

ANOREXIA NERVOSA.—Although this condition is only one of the manifestations of hysteria, it demands particular notice because of its serious nature. For the general treatment, *see* Hysteria ; the special points to be noted are as follows :—

It is the one neurosis which may end in death. This event does not occur directly from the disease, for the hysteric is not a person who commits suicide ; but from the supervention of tuberculosis, which is prone to attack emaciated patients in an acute form. It is almost impossible to treat a patient suffering from anorexia nervosa at home. She—the disease is confined to the female sex—has taken complete command of the household ; she has decided that she cannot eat, and though she will promise to make every effort, nothing will be accomplished unless the environment is changed. On the other hand, no patients are fed and made fat more easily if removed from the care of relatives who are at the same time over-solicitous and exasperated. She should therefore be sent to an institution, and put under the care of an experienced nurse : one who, though kind, will not depart one hairbreadth from the doctor's orders. She should be strictly isolated, receiving no visitors, and not reading or writing letters. A diet scheme as described in the article on Neurasthenia should be drawn up ; but because of the secondary physical changes the progress in feeding must be slower than is there laid down. Along with the profound somatic wasting there is present failure of the gastric functions

of secretion and motility, so that if food is administered recklessly it may merely accumulate in the stomach, to be vomited later. For the first few days only small quantities of milk should be given, three or four ounces every three hours the first day, five or six the second, and so on, increasing only gradually. In very severe cases the milk should be peptonized, but for psychical reasons this should not be continued for more than a few days. As soon as possible the patient must be put on ordinary food. The nurse should feed the patient, not because the latter is physically unable to feed herself, for these patients do not feel weak, but because if left to herself the patient will probably play some trick, and dispose of her food surreptitiously.

Although massage is not as a rule necessary for hysterical patients, it is of considerable advantage for these. The gastric failure of motility is overcome by it; it aids the development of the emaciated limbs.

No relaxation of the rules should be permitted till the patient has regained nearly her normal weight.

The details of psychotherapy will be gradually worked out as the case proceeds, according to the method described in the article on HYSTERIA; but the first need is for the patient to feel that at last she has come under the care of someone who can manage her; though the velvet glove should always conceal the iron hand. (*See also* PSYCHONEUROSES.) *T. A. Ross.*

ANOSMIA.—The treatment depends upon the cause. Anosmia may be (1) *Obstructive*, some obstruction in the nose preventing access of the olfactory particles to the olfactory area; (2) *Essential*, an affection of the olfactory mucous membrane or nerve-endings; or (3) *Central*, disease or injury of the brain or of the olfactory nerve or centre. In the first form the treatment consists in the removal of the obstruction. If this can be effected, recovery may take place, although the sense of smell has been in complete abeyance for years. The most common causes are nasal polypus or œdema of the middle turbinate, such as may occur in sinus suppuration, or, temporarily, in a simple catarrh. The chief causes of essential anosmia are poisons, such as cocaine, morphia, and tobacco, and the toxins of influenza and syphilis. In syphilitic cases, iodide of potassium must be given; in influenza, the most hopeful treatment is the internal administration of large doses of strychnine and phosphorus; arsenic also may be tried. Good feeding and change of air are beneficial. In central anosmia due to lesions of the brain, little can be done; but if the loss of smell be due to neurasthenia or hysteria, appropriate general treatment will often effect a cure. *H. Lambert Lack.*

ANTHRAX.—In the external form the pustule must be excised, all affected tissue being removed as completely as possible. The resulting raw surface should be swabbed with carbolic acid (1–10). A few minims of a 1–20 solution of carbolic acid, in equal parts of water and ether, should be injected in six or seven places round and beneath the wound. A compress of the same solution should be applied, and over it an ice-bag (J. H. Bell). Instead of carbolic acid, potassa fusa, or chloride-of-zinc paste, may be applied to the wound. Gräf advises, instead of excision, the cauterization of the pustule by rubbing it firmly and thoroughly with solid caustic potash. Ipecacuanha powder, externally (after excision) and internally, has been strongly recommended by Dr. Muskett and the late Mr. Davies-Colley. In addition to local treatment, 20 to 60 c.c. of Sclavo's serum should be injected hypodermically, and repeated if necessary. This serum is stated to be both antimicrobic and antitoxic. Such favourable reports have been published concerning it, that it should certainly be given a trial in all forms of the disease. If the serum is not readily obtainable, pyocyanase (a vaccine prepared from the *B. pyocyaneus*) may be employed. Good results have also been claimed for salvarsan (0·3 grm. intravenously). (*See also* SPECIFIC THERAPY, and FEVERS, ACUTE INFECTIOUS.) *E. W. Goodall.*

ANTRUM, SUPPURATION IN.—(*See* NOSE, ACCESSORY SINUSES OF.)

ANURIA.—(*See* URINE, SUPPRESSION OF.)

ANUS, SURGICAL DISEASES OF.

Anal Abscess. (*See* ABSCESS.)

Epithelioma of the Anus (*see also* RECTUM, CANCER OF).—Wide and extensive removal of the growth at the earliest opportunity is the only treatment. The sphincters must be unhesitatingly sacrificed, together with a wide area of skin round the growth, and it is best to perform a preliminary colotomy, so as to give the patient control over the evacuations and prevent contamination of the large wound which must result from removal of the growth. As the whole anal region and sphincter muscles have to be removed, the patient is better off with a colotomy than he would be if any attempt were made to bring the bowel down. The question of removing the glands in both groins at the same time must also be considered, as these glands not infrequently are involved early. Radium and *x* rays should never be used as a substitute for operation when the latter is possible; but as a means of preventing recurrence, *x*-ray treatment is of value, and in inoperable cases it is sometimes of great service. The rays should be used by what is called 'cross-fire' method, and large doses given. Very good results have been obtained by this method in inoperable cases. Radium may also be of value.

Anal Papillomata (Warts).—The commonest forms of anal warts are the condylomata which occur round the anus as a manifestation of secondary syphilis. These as a rule require no special treatment beyond that necessary for the constitutional malady. True anal warts resemble the warts which occur on the hands, and are probably due to infection of the skin with staphylococci. They are whitish in appearance, and are often present in great numbers, so as almost to obscure the anal orifice. I have known them mistaken for epithelioma. These were supposed to be due to gonorrhœa, but occur quite apart from this disease. When not numerous they may be got rid of by dusting the parts with calomel powder, or touching them with copper sulphate in crystal form.

When numerous they should be cut off with scissors under proper antiseptic conditions, care being taken to see that undue contraction of the anal orifice will not result from the healing of the wounds. When the wounds have healed, the patient must be seen at frequent intervals, and any warts which return burnt down with pure fuming nitric acid on the end of a match.

Fissure of Anus.—By this we understand an ulcer just within the grasp of the external sphincter, which calls for treatment on account of the extreme pain which it causes, and because it may result in a fistula. The only certain method of curing a fissure is to incise its base in such a manner as to ensure that there is a free drain for the discharges on to the surface of the skin. With this object the incision must be brought well out on to the skin. Palliative treatment with ointments, etc., is only successful in very slight cases; the time required for healing is often considerable, and the results are often unsatisfactory. Incision, properly carried out, is followed by immediate and complete cure.

OPERATION.—The external parts are cleansed as well as possible, and the patient is anæsthetized. A straight cut is then made with a knife from the uppermost limits of the fissure straight through its base and well out on to the skin. The incision must be deep enough to divide all the base of the fissure and the outer fibres of the external sphincter muscle. The edges of the incision should be trimmed off so as to leave a flat wound rather than a slit. Any bleeding that occurs is easily stopped by pressure. A small piece of wool is placed in the cut and a bandage applied. If the fissure be complicated, as it often is, by a small polypus or external pile, this is cut off with scissors at the same time. The wound should be dressed daily and the patient kept lying down till the wound is quite healed. There is no necessity to divide the sphincter muscle; all that is required is the provision of adequate drainage.

If a general anæsthetic is contra-indicated, the incision can easily be made under local anæsthesia. For this purpose some of the following solution should be injected with a fine hypodermic needle beneath the base of the fissure before making the incision :—

℞ β-Eucainæ Hydrochloridi (4%) pt. ix | Sol. Adrenalini (1–1000) pt. j

A cure can sometimes be effected by simply stretching the sphincter, but this must be done under a general anæsthetic, and it is unreliable; or in very slight cases the patient

may be kept in bed and the bowels kept acting loosely with an aperient, and in addition some such ointment as the following may be squeezed into the anus :—

℞ Bismuthi Subnitratis gr. cxx | Vaselini ℥j
Cocainæ Hydrochloridi gr. viij |

This should be in a collapsible tube with a bone nozzle, or used with an ointment introducer. Operation, however, is the best treatment, and the quickest in the end. Fissures should never be neglected, as they often cause fistulæ.

Fistula in Ano.—There is no treatment other than by an operation. When a fistula has been detected it should be operated upon as soon as possible ; a much more severe operation may have to be performed if it is neglected. Fistulæ are often divided into blind internal, blind external, and complete, but the treatment is the same in each case.

Operation.—This consists in freely laying open the fistula by a grooved director and knife, and then laying open all the side tracks, if there are any. If a single pocket or track is missed, the operation is almost certain to be a failure, and it is here that the difficulty of successfully operating for fistula arises. The sphincter should never be divided in more than one place and care should be taken not to cut the muscle fibres on the slant. It used to be supposed that division of the sphincter muscle was necessary to obtain healing of a fistula. This is, however, not the case. Most fistulæ do not pass deep to the external sphincter muscle, and it is not necessary to divide this muscle ; free and adequate drainage of the fistulous track is alone necessary, and the sphincter should never be divided unless drainage of the fistulous track is not otherwise possible. Small straight fistulæ should be cut out. Large and tortuous fistulæ must be laid open freely and all granulation tissue scraped away. Not only should the fistulous tracks be laid open, but the edges should be cut away, bearing in mind that the object is to leave a wound without pockets, which will have the freest possible drainage on to the skin surface. The wound should not be plugged, but just lightly packed with wool or ribbon gauze. Subsequent treatment should consist of daily baths, in which the packing should be soaked out, followed by irrigation of the wound with sterilized water or 1–60 carbolic and *very light* packing with strips of wool. The patient should not be allowed to get up until the wound has soundly healed. It must be kept clean, as if sloughing occurs serious contraction is likely to result.

Contrary to what is often supposed to be the case, the operation for fistula requires special skill and considerable experience if a cure is to be obtained. This is well known to those surgeons who make a speciality of rectal surgery, for nearly half the patients presenting themselves for treatment have previously been operated upon, many of them several times.

Common mistakes in operating for fistula are :—

1. Failing to find and open all the tracks.
2. Operating for the fistula when there is an acute abscess. The abscess should first of all be drained, and the fistula operation done at a later date.
3. Not providing proper and sufficient drainage. In other words, not cutting freely enough or removing enough skin.
4. Attempting to do too much at one operation instead of doing it in two stages.
5. Not keeping the wound clean. Dressings should be done two or three times daily.
6. Packing wound too tight.
7. Not keeping patient in recumbent position long enough.
8. Interfering too much with the wound in the later stages, e.g., applying caustic, etc.

(*See also* Colotomy, Hæmorrhoids, Pruritus Ani.) *J. P. Lockhart-Mummery.*

AORTIC VALVULAR DISEASE.—(*See* Heart, Valvular Diseases of.)

AORTITIS.—(*See* Atherosclerosis.)

APHASIA (in Hemiplegia).—Right-sided hemiplegia is nearly always associated with some defect of speech, except in left-handed people. In some cases the defect is transitory, in others permanent. If transitory, it is either because the speech centres and their connections on the left side of the brain are temporarily damaged, but not destroyed,

or because those on the right side take on the function of those on the left. If permanent, it is probable that not only the speech centres on the left side and their inter-connections or commissures are destroyed, but the path through the corpus callosum between them and the right-sided centres is broken. It is impossible in a given case to say whether or not the callosal fibres are interrupted, and therefore each case should have the benefit of the doubt, and treatment will aim entirely at *re-education* of the right-sided speech centres when those on the left side have been injured.

The variety of speech defects in hemiplegia are numerous and complicated. Only the simple and uncombined forms can be considered here, with reference to treatment.

Aphasia may be (*a*) *Motor*, (*b*) *Sensory*.

a. In purely **Motor Aphasia** the patient understands spoken and written or printed words and sentences, but mispronounces and cannot articulate, or he utters 'dead propositions' or set phrases such as 'dear, dear!' whenever he speaks. He is conscious of this defect. He may be able to write spontaneously or at dictation, and to copy—after practice—with his left hand. The treatment consists in endeavouring to teach him to articulate on the oral system, as practised in the deaf and dumb.

b. **Sensory Aphasia** may be *Auditory* or *Visual*.

In *Auditory Aphasia* there is 'word deafness'. The patient cannot understand spoken words, although he hears them. He can copy, but cannot write at dictation. He may be able to speak, but uses wrong words without knowing it, in contradistinction to the motor aphasia. The treatment consists in endeavouring to rouse the *visual* memory of words and objects, when audition of their names and sounds conveys no meaning. Thus, a spoken word should be written or shown in print, and the object or a picture of it displayed, whilst mentioning its name to the patient.

Word Blindness.—Here the patient may be able to write spontaneously or at dictation, even with eyes shut, but does not understand written or printed words, nor can he copy. He cannot read aloud (Alexia). Treatment consists in teaching him to trace written or printed letters with his finger in the air, or to use the 'Braille' raised-letter system as employed for the blind. The combination of 'word blindness' and 'word deafness' constitutes 'mind blindness', in which the unfortunate patient recognizes neither persons, objects, nor words. Here it is only possible to attempt to educate the sense of touch, a method which proved of signal success in the cases of Laura Bridgman and Helen Keller, who were deaf, dumb, and blind.

Verbal Amnesia is usually associated with some word deafness and motor aphasia. In its simplest form the patient cannot recall words or the names of objects. He can copy and understand written and spoken language, but cannot write spontaneously. He may be able to write a single word at dictation. He can repeat words and names of things at dictation, but immediately forgets them. He should be encouraged to repeat strings of words and names over and over again, his vocabulary being daily enlarged.

Agraphia.—In all cases of right-sided hemiplegia the patient should be encouraged to write with his left hand, and indeed to use his left hand as much as possible, for working and other purposes, in order to stimulate the right side of the brain. When motor aphasia is present, however, attempts to write are often impossible until the patient has recovered some power of articulate speech. When word and letter blindness are not present, the curious errors, such as repetition of syllables and substitution of consonants, which render writing unintelligible, may be overcome by practice of copying.

In all cases of aphasia the principle of treatment is to observe first the main defect, and then to devise appropriate exercises to remedy it. Such exercises should be of the simplest nature at first, and each should be mastered before more complex ones are attempted. Exercises should never be practised long enough to cause fatigue, and should be repeated frequently, for short periods, during the day. *Leonard G. Guthrie.*

APOPLEXY. (From Cerebral Hæmorrhage, or Occlusion of Cerebral Vessels.) (*See also* HÆMIPLEGIA.)—Apoplexy implies loss of consciousness, of sensation, and of voluntary movement, occurring, more or less suddenly, in consequence of rupture or occlusion of cerebral vessels. Both cerebral hæmorrhage and occlusion of vessels may take place without loss of consciousness, but in this paper only cases in which unconsciousness attends or supervenes on either condition will be considered as apoplexy. Deep and

instantaneous coma is rarely the result of an intracerebral vascular lesion. When it occurs, the lesion is usually so extensive as to render treatment hopeless.

Most cases of apoplexy may be divided into two stages, which it is important to recognize, as each requires treatment appropriate to its cause :—

1. *The Initial Shock.*—Collapse or syncope, with loss of consciousness, often preceded by sudden vertigo, pain in head, and vomiting. To this stage the term 'cerebral surprise' has been applied. It is usually followed by a rally or return to consciousness, succeeded more or less gradually by :—

2. *The stage of Apoplectic Coma.*

Diagnosis is always a matter of probability rather than of certainty. Guidance is afforded by knowledge of the various causes, by the patient's age, and the condition of his heart, vessels, circulation, and kidneys, and by his history. Hæmorrhage may be suspected in the middle-aged and elderly ; occlusion of vessels in the old and young. Hard arteries are not proof of hæmorrhage, but high arterial tension is in favour of it. Chronic Bright's disease is the most frequent cause of hæmorrhage. In young adults, not subjects of chronic interstitial nephritis, thrombosis or embolism is more probably the cause than hæmorrhage. Embolism is most likely in cases of mitral stenosis, or in cases calculated to promote intracardiac thrombosis. In young adults, too, in whom no other cause can be detected, thrombosis due to syphilis may be divined.

Some help is afforded by the mode of onset. 'Cerebral surprise', or initial shock, is most commonly the result of sudden hæmorrhage, or occlusion of a large vessel by embolism.

In thrombosis, premonitory symptoms, such as headache, mental confusion, giddiness, weakness, or paræsthesia of limbs, are fairly common. It should be remembered that hæmorrhage not infrequently takes place into areas previously softened by the effects of thrombosis.

Post-epileptic coma may be indistinguishable from apoplexy except by eliciting a history of former epileptic fits. Narcotic coma can be distinguished from apoplexy only by circumstantial evidence. Hæmorrhage into the pons Varolii strongly simulates opium poisoning. In the former the temperature is usually high ; in the latter it is low. Diabetic and uræmic coma must be thought of, but are hardly likely to be confounded with apoplexy when the patient's history is known. Albuminuria is in favour of hæmorrhage.

Finally, cerebral hæmorrhage is not confined to stout, plethoric, short-necked, quick-tempered, gouty individuals, who indulge in gross feeding and alcohol ; it may occur also in meagre, debilitated ascetics.

A.—APOPLEXY FROM CEREBRAL HÆMORRHAGE.

Treatment.—The treatment of intracerebral hæmorrhage naturally falls under two headings : (1) To arrest bleeding from the ruptured vessel ; (2) To relieve pressure symptoms produced by the extravasation. In both, treatment must be based on physiological and pathological data, and also on the symptoms present.

I.—To Arrest Hæmorrhage.

Bleeding from a ruptured intracerebral artery cannot be directly controlled. The vessel cannot be compressed or tied. Probably, arrest of hæmorrhage would never take place before the patient died were it not for pressure of the extravasated blood upon the ruptured vessel, and sealing of the aperture by spread of coagulation. It is only possible to favour coagulation by lowering the flow of blood through the perforated artery.

Effects of Shock or Syncope.—The initial shock or collapse caused by the giving way of an intracerebral vessel will tend to stay the hæmorrhage by reducing arterial blood-supply. Hence strenuous efforts to rouse the patient and to restore consciousness under this condition are inadvisable. The hæmorrhage may recur with the return of consciousness. Initial shock from hæmorrhage is unlikely to be fatal unless the rent in the ruptured vessel be large. Masterly inactivity is the best policy. Injections of strychnia, digitalis, ether, and brandy should be avoided.

Absolute rest in recumbent position, with head and shoulders slightly raised, should be secured. The room should be cleared, if crowded, and kept airy ; the patient's collar should be taken off. Life may usually be sustained by warmth ; hot flannels may be applied to the præcordia, hot bricks or bottles to the feet and between the thighs. Brandy, almost invariably, will have been poured down the patient's throat in more than sufficient quantity before the doctor arrives. When otherwise, a few drops may be placed on the tongue or used to chafe the lips. To avoid the imputation of doing nothing, anxious relatives and bystanders may be despatched on various quests for hot water, bricks, blankets, bottles, pillows, rugs, and sal-volatile.

Rest and warmth are the best means of retaining life, without endangering it by

starting hæmorrhage afresh. Whenever possible, the patient should be kept for at least twelve hours in the place where the seizure has occurred. When removal home or to a hospital is unavoidable, it should be effected in an ambulance, not in a four-wheeled cab. When a bulky man is seized by apoplexy in a dining-room, it is safer to improvise a couch for him there than to convey him to a bedroom upstairs. Unfortunately, as soon as he regains consciousness, he usually at once insists on walking upstairs or going home. Recurrent hæmorrhage follows in consequence. Many lives have been thus sacrificed. Syncope probably checks hæmorrhage, and allows time for coagulation to occur. Unless it be so profound as to endanger life, it should not be energetically treated. With reaction from syncope, hæmorrhage may be renewed, with symptoms of so-called ingravescent apoplexy. The patient becomes increasingly drowsy until comatose. Localizing signs, such as hemiplegia, make their appearance.

The methods designed to stay recurrent hæmorrhage are :—

1. *Arterial Depletion.*—The indications for arteriotomy of the temporal artery were long considered to be a forcible, rapid, or slowly heaving heart, with a full, bounding, incompressible pulse.

Undoubtedly a powerfully acting heart, together with a condition of general high arterial tension all over the body, will increase the force and rapidity of the blood-flow through the ruptured artery in the brain. Hence it seemed the obvious course to let out blood from overfilled arteries. Temporary benefit from cutting the temporal artery was often remarkable. The patient quickly recovered consciousness, even whilst the blood was flowing, but speedily lost it again, because he fainted. If he died, some said he was bled too much, and others, not enough. The former conjecture was probably correct.

On pathological grounds it is difficult to see how arteriotomy could be beneficial. The general high tension which prevails in most cases of cerebral hæmorrhage is due not to absolute but to relative plethora, consequent on general vasomotor constriction. Abstraction of a large quantity of arterial blood under these conditions might certainly relieve cardiac labour, but only momentarily, for, given continuance of vasomotor constriction, high tension must soon recur, and in a patient rendered weaker than before by loss of arterial blood. Arterial blood is life. It cannot be profitable to lose it. In the case of venous blood it may be otherwise. If, as stated, high arterial tension and blood-pressure depend upon narrowing of the calibre of arteries and arterioles in general, the most reasonable course would be to *increase the calibre of the blood-vessels* rather than to *diminish their contents.* The result would be to flood the body in general with arterial blood, and so deplete the cerebral arterial supply ; for the cerebral vessels have no efficient vasomotor system, and therefore when the general arterial system is contracted the cerebral arterial supply is increased.

Crude methods of 'determining blood' to the surface and extremities so as to diminish the supply to the brain have always formed part of the stock treatment of cerebral hæmorrhage. Sinapisms, rubefacients, hot irons, Burgundy pitch plasters to the calves and soles of the feet, blisters to the nape of the neck and to the shaven scalp—'universo capiti'—were styled counter-irritants, but were really barbaric means of withdrawing blood from the brain to distal parts. Their net result could only irritate. Celsus summed them up as "means which often only delay death when it seems at hand, and meanwhile prove troublesome to life." Less antiquated methods which have been used are 'Junod's boot', in which air is partially exhausted around the limbs, and the application of constricting bandages to their proximal parts. Local measures of the kind can be of infinitesimal value only. The use of a hot-air cradle over the lower limbs is perhaps reasonable in theory, but has the disadvantages of raising the temperature generally and quickening the pulse. If used, the temperature of the air-bath should not exceed 180° F. or thereabouts.

Nitrite of amyl and nitroglycerin produce flushing, throbbing of vessels, headache, with dilatation of vessels, fall of general arterial pressure, and *greatly diminished cerebral circulation* (Hill). Hence, when vasomotor constriction is producing high arterial blood-pressure and increased cerebral circulation, the use of nitrites would seem to answer all purposes required, without the disadvantage attending arteriotomy. The objection which may be raised against nitrites is that by their direct action on the blood they may increase

asphyxia, which, after all, is the chief danger to be apprehended in cerebral hæmorrhage. Their utility in cases of generalized arteriosclerosis in decrepit elderly subjects is doubtful, but in youngish patients whose vessels are on the whole sound, though in a condition of generalized constriction, nitrites may prove valuable.

Inutility of other Drugs as Hæmostatic Agents.—Such drugs as ergot, adrenalin, digitalis, and strychnine, which raise arterial blood-pressure by causing contraction of arterioles, cannot be recommended in cerebral hæmorrhage. The main object of treatment is to keep arterial blood-pressure low. In the majority of cases the pressure is already too high. The above-named drugs can only increase it if the contractile elements of the vessels are in working order. Chloride of calcium has been suggested owing to its action in increasing the coagulability of the blood. If it could be employed for some days before the occurrence of the hæmorrhage, no doubt it might be beneficial. To use it afterwards would seem to be as reasonable as to attempt to stop a leak in a water-pipe by putting plaster-of-Paris in the cistern.

2. *Direct Compression of the Carotid Artery.*—If one can be certain that bleeding has occurred from an intracerebral branch of the carotid, e.g., middle cerebral, and not from a branch of the postcerebral or basilar, compression of the common carotid is a logical procedure. Ligature of the vessel is an operation too formidable to need consideration.

Finally, hæmostasis may be favoured by keeping the head and shoulders slightly raised and the feet dependent. Application of an ice-bag or of Leiter's tubes to the head may perhaps be beneficial.

II.—To Relieve the Pressure Symptoms.

The Second or Pressure Stage of Cerebral Hæmorrhage.—The symptoms are coma, with stertorous, laboured, irregular respiration, lividity or congestion of face, turgescent throbbing cervical veins, glistening conjunctivæ, pupils dilated or contracted, nystagmoid movements of eyeballs, and sometimes convulsions. Respiration gradually fails, may become of Cheyne-Stokes variety, or gasps may occur at increasing intervals, until the last breath is drawn. The pulse at first may be full and bounding, quick or slow. Later, arterial blood-pressure falls as signs of pulmonary obstruction appear, and the air-passages become choked with bronchial secretion. The pulse then becomes small, weak, and irregular, the right side of the heart dilates, becomes engorged, and blocks the entry into it of venous blood. As a rule the heart continues to beat after respiration has ceased. Death is due to asphyxia.

The symptoms are those of acute cerebral anæmia. They are produced by compression of cerebral vessels by the extravasated blood. Anæmia, thus caused, affects the bulbar respiratory centres, and so gives rise to asphyxia and gradual respiratory failure.

Asphyxia in apoplectic coma is also partly due to mechanical obstruction to air-entry into the lungs. This is indicated by the familiar stertor, and is caused by paralysis of tongue, palate, and cheeks, and by weakness of respiratory muscles and accumulation of mucus in the bronchi. Such mechanical asphyxia impedes the return of cerebral venous blood to the heart, and thus causes cerebral venous congestion, which aggravates intracerebral pressure already occasioned by the hæmorrhage.

Venous congestion and anæmia produce similar effects; both starve the respiratory centre of oxygen.

Treatment should aim at (1) Relief of direct pressure on the brain by the existing clot; and (2) Prevention or counteraction of secondary pressure (venous congestion) occasioned by mechanical asphyxia.

1. *Methods of Treating Cerebral Compression caused by Hæmorrhage.*—In traumatic cases, when the bleeding is from a meningeal vessel, and upon the surface of the brain, the obvious course is to trephine, close the bleeding vessel, and turn out the clot. The method in such cases has been strikingly successful, but is inapplicable in most cases of spontaneous intracerebral hæmorrhage. In a few selected cases, however, 'decompression' operations—with or without attempts to evacuate extravasated blood—as practised by Harvey Cushing, Osler, and others, may be justifiable. Craniectomy alone, to be of service, must be extensive, for Hill has shown that removal of a small circle of bone gives no relief, as the brain presses up against the trephine hole and closes it like a valve.

A student, age twenty-five, under care of Wilfred Harris, had suffered for a fortnight from severe symptoms of intracranial pressure. Professor Pepper trephined and let out one and a half ounces of blood from the interior of the brain. The patient made a complete recovery. Russell and Sargent trephined a woman, age fifty-four, who had been comatose and hemiplegic for ten days, explored the brain, and evacuated three drachms of blood from a cyst situated two and a half inches beneath the cortex. This patient also

survived, but was still aphasic and hemiplegic nine months later. Russell and Sargent recommend operation when there are "strictly unilateral symptoms indicative of a localized hæmorrhage in the white matter, not flooding the ventricles, with deep coma and high blood-pressure."

It must be admitted, however, that in similar conditions recovery may be spontaneous, even after coma of six weeks' duration. Operations of any kind are clearly contra-indicated in elderly patients with advanced cardiovascular changes and renal disease. The temporary improvement and fall of blood-pressure noted in operation cases which ended fatally, may be attributable to loss of blood alone. Subcortical hæmorrhages causing pressure symptoms in young subjects are most suitable for operation. Even in these, success will depend chiefly on the degree of fluidity of the extravasated blood. A firm coagulum cannot be extracted without additional damage to the brain itself, and at the risk of exciting hæmorrhage afresh.

The difficulty in diagnosing hæmorrhage from occlusion of cerebral vessels has to be borne in mind. An operation conducted under a mistaken diagnosis would be useless and probably fatal. It may be concluded that in the great majority of cases no surgical treatment can obviate the results of direct compression of cerebral vessels by a clot in the interior of the brain. We can only try to prevent increase of the pressure which already exists.

Lumbar puncture has been recommended, but it is difficult to see how it can relieve intracranial tension due to hæmorrhage or œdema. Also the sudden withdrawal of cerebro-spinal fluid may lead to the medulla being forced down into the foramen magnum, with immediate disastrous results.

2. *Asphyxia*, due to mechanical obstruction of respiration, may be combated by drawing forward the tongue and chin, and placing the patient on his side, so that secretion may trickle out of the mouth instead of passing down the trachea. He should lie on the paralyzed rather than on the non-paralyzed side, in order to allow the latter some scope for action. When the bronchi are becoming choked with mucus, injection of atropine may check the secretion. Atropine may also be useful in stimulating the respiratory centre and in lowering arterial tension.

Venous Depletion, indirect and direct.—Purgation by calomel or croton oil answers the purpose of indirect depletion, and may in clear cases of cerebral hæmorrhage be recommended. *Venesection* fell into disrepute in apoplexy because it was carried to excess, and was used indiscriminately for all cases of unconsciousness, whether due to hæmorrhage, occlusion of cerebral vessels, or simple syncope. The indications for venesection are, however, fairly clear, and if correctly observed it is difficult to believe that abstraction of a few ounces of venous blood can be otherwise than beneficial in cases of cerebral hæmorrhage in the second stage. The condition which venesection may relieve is venous congestion of the brain, intensified by obstruction to exit of the blood from the right heart, such obstruction being the result of asphyxia.

When the right heart becomes engorged and unable to empty itself, backward pressure spreads to the jugular, and thence to the cerebral veins; a condition which aggravates pressure already produced by the intracerebral clot. The condition can be rationally treated only by temporarily aiding the right heart and removing the intravenous cerebral pressure by tapping a vein.

The condition which warrants venesection is manifested by a full, tense pulse, a labouring heart, with failure and acute distention of right auricle and ventricle, and engorgement of the cervical veins. Venesection is contra-indicated by a weak, small, fluttering pulse with failure of a chronically (not acutely) dilated heart in debilitated, aged subjects.

When coma is profound and lasting, and the hæmorrhage extensive, venesection is unlikely to afford even temporary benefit; but when venous engorgement and distention of heart and veins have been largely brought about by mechanical obstruction of respiration, venesection, together with means to secure free entry of air into the lungs, may tide the patient over the immediate danger of death from asphyxia. Venesection may in fact relieve an acutely distended heart in those circumstances, as it undoubtedly does in cases of distention due to purely intrathoracic causes of obstruction.

Methods of Venesection.—Although it would seem most rational to draw blood from the external jugular vein, with a view to relieving at once both heart and brain, it is safer,

easier, and perhaps as efficacious, to open a vein at the bend of the elbow, in the usual manner.

The opening in the vein should be free, and not more than 8 or 10 oz. of blood should be withdrawn—as speedily as possible. The operation should never be repeated. When it is found impossible to overcome the prejudice of the patient's friends against bleeding, the application of two or three leeches to each mastoid process may be recommended; or dry cups may be employed extensively over the chest. Dry cupping is painless, and causes but little disturbance to the patient.

Diuretics are probably of little value, but distention of the bladder should be looked for, and relieved by catheterization, even when there is incontinence of urine.

Finally, to avoid entry of food into the larynx, an unconscious patient should be fed by nasal tube. The danger of bedsores and burns by hot bottles should be anticipated.

B.—APOPLEXY FROM OCCLUSION OF CEREBRAL VESSELS.

Treatment.—In hæmorrhage, as we have seen, the main desiderata are a quietly working heart and low arterial tension, in order to favour stagnation and hasten coagulation at the site of the injury. In occlusion by thrombosis of a cerebral artery, one desires to stimulate the heart, raise arterial tension, and accelerate the circulation, in order to lessen the tendency to further coagulation.

Initial Shock or Syncope produced by Occlusion of Cerebral Vessels.—Although probably beneficial in hæmorrhage, syncope must be the reverse in cases of vascular thrombosis, and it is therefore important to revive the patient as speedily as may be. Warmth is essential. Bags of hot water should be applied to the præcordia, heat being the best of cardiac stimulants. The patient should be recumbent, the head and shoulders low, but not too low, lest return of venous blood from the brain be impeded. The foot of the bed should be a little elevated. As soon as consciousness returns, the head and shoulders may be raised slightly and the end of the bed lowered.

Stimulants must be given, but not too freely. Physiological considerations must be subservient to pathological conditions present. For in thrombosis due to local atheroma, excessive stimulation may rupture the weakened vessel, and cause hæmorrhage into an area of brain already softened, and thus make matters worse. Such hæmorrhage is by no means uncommon. Again, in cases of embolism from detachment of fibrin from a diseased cardiac valve, vigorous stimulation may dislodge another embolus.

A single dose of ether and ammonia, or a tablespoonful of brandy, may be given at once; smelling salts or burnt feathers may be held under the nostrils. Such measures will be sufficient to cause a rally, without undue vascular excitement.

Purgatives.—The common custom of giving, indiscriminately and at once, croton oil or a large dose of calomel to all patients who are found unconscious and hemiplegic, cannot be too strongly deprecated. Infinite harm may be done by drastic purgation in cases of thrombosis. The patient is weakened thereby, and his blood rendered more coagulable than before. It is a safe rule to avoid drastic purgatives in all cases of apoplexy in early stages, except, perhaps, when the diagnosis of hæmorrhage in robust, plethoric, heavy-drinking and large-eating individuals is clear. When consciousness returns in cases of vascular occlusion, a dose of castor oil, followed if necessary by a simple enema, is quite sufficient to secure evacuation of the bowels.

To Prevent the Spread of Coagulation.—Arterial tension may be raised, cardiac force increased, and circulation quickened, by cardiovascular stimulants. The indications for their use must depend upon the actual condition of the cardiovascular system. For instance, such drugs as strychnine, digitalis, and ergot may, by causing extreme vascular constriction, seriously embarrass a weakened and dilated heart. Except in cases in which extensive degeneration of the walls of arteries and arterioles precludes the possibility of their reacting physiologically to drugs, cardiac stimulants should be combined with vascular dilators, such as nitroglycerin. Nitrite of amyl and nitroglycerin alone are contra-indicated in thrombosis of cerebral arteries, owing to their action in depleting cerebral vessels by lowering systemic arterial pressure. But this effect may be counteracted by giving digitalis or, better still, strychnine, simultaneously. With this object, nitroglycerin in 1-drop doses of the 1 per cent solution may be given with 2 or 3 min. of liquor strychninæ. On the other hand, it must be remembered that neither vasomotor dilators nor

constrictors can have much action on vessels whose walls are extensively atheromatous and rigid. After death in such cases one may find the brain substance softened to fluidity, and the vessels suspended in it like branches of dried seaweed. Treatment in these conditions is obviously futile.

Powerful cardiac stimulants can only, as said before, tend to burst atheromatous and thrombosed vessels, by increasing cardiac force and rapidity. Strychnine, strophanthus, digitalis, and perhaps ergot, may be given when thrombosis seems to be the result of general enfeeblement, cardiac weakness without disease, and morbid blood conditions.

Thrombosis due to Syphilitic Endo- and Peri-arteritis.—No cases seem to be more promising for the success of treatment, and yet are more disappointing, than these. The hemiplegia which results is often permanent, and antisyphilitic treatment is useless. This is doubtless because if blood-supply is cut off from an area of the brain for any length of time, the brain tissue dies. However, in a certain proportion of cases the circulation is not entirely cut off—the nutrition of the brain is merely impaired, and may be restored. Therefore, in all recent cases, when the diagnosis is certain, the patient should be subjected to mercurial treatment. Inunction with mercurial ointment until slight salivation occurs is the best course. The innumerable preparations of mercury for subcutaneous or intramuscular injection are yet on their trial. Many of them seem not to be absorbed after injection, and practically all are painful. The iodides may be given in small doses (7 to 8 gr.) three times daily, but large doses should be avoided, on account of their tendency to promote coagulation.

Salvarsan would seem to be specially useful in cases of early hemiplegia due to syphilitic cerebral arteritis (*see also* SYPHILIS).

Treatment of Coma following Vascular Occlusion.—Deep coma is less common in cases of occlusion of cerebral vessels than in those of hæmorrhage; but when a large vessel is plugged, it may occur with resolution of limbs and interference with respiration as profound as in hæmorrhage. The symptoms are in fact the same as those of pressure by intracranial hæmorrhage, and considering that diminution of cranial contents rather than increase must be the result of blockage of a large vessel, it is difficult to explain their occurrence. The investigations of Mott, Horsley, and others, however, have shown that pressure symptoms are due to anæmia of the bulb, a condition produced as much by hæmorrhage as by cutting off the cerebral arterial blood-supply, or by intracerebral venous congestion. Deep coma following occlusion of cerebral arteries is therefore due both to anæmia and to venous congestion, which must necessarily be the consequence of arterial blockage.

When, therefore, signs of respiratory embarrassment with venous engorgement and cardiac dilatation are present, the treatment does not differ from that of the same condition occurring in consequence of cerebral hæmorrhage. The danger of *mechanical asphyxia* from obstruction of entry of air into the lungs should be averted by attending to the patient's position, as in cases of hæmorrhage. When suffocation from accumulation of bronchial secretion threatens, atropine, $\frac{1}{100}$ gr., with strychnine, may be injected hypodermically, with a view to checking the secretion of mucus and stimulating respiration.

Calomel may now be given in order to relieve abdominal venous plethora. Pulmonary congestion should be treated, and the right heart relieved by dry cupping. Cerebral venous congestion may be lessened by leeching the mastoid processes. Direct abstraction of blood in these cases is regarded as inadmissible; yet venous congestion, unless relieved, will in all probability prove fatal. Venous blood is useless to the brain for the purpose of nutrition. One is therefore justified in these circumstances in attempting to relieve immediate necessities by withdrawing a few ounces of venous blood.

After-treatment of Thrombosis.—The distressing headache, due to febrile reaction, which follows thrombosis, may be alleviated by leeching the mastoid processes. No more than two leeches should be applied. Phenazone with citrate of caffeine may also be administered, for relief of headache and pyrexia, and an ice-cap may be affixed to the head. Diuretics, such as spirit of nitrous ether in ½-drachm doses, are also useful.

Convulsions or delirium are not uncommon during the reactionary stage, and if they do not yield to the measures mentioned above, bromides in moderate doses (½ drachm) may be given, with digitalis.

The majority of subjects of thrombosis are debilitated and worn out. They require nutritious and easily assimilated food, but care should be taken not to overload digestive

powers. Bland fluids, such as barley-water, may be freely supplied, in order to lessen viscosity of the blood. Alcohol may be needed when the heart and pulse are weak and fluttering, but should be withheld, if possible, during the reactionary or febrile stage. The greatest care should be exercised in prevention of bedsores. The bowels should be regulated without active purgation, and retention or incontinence of urine appropriately treated. Tranquillity of mind and body is essential, for any cardiac disturbance may be followed by reactionary failure and extension of thrombosis.

Treatment of Embolism.—Treatment can neither dislodge nor dissolve an embolus. One can only hope to prevent the passage of other emboli into the cerebral circulation, and to lessen the thrombosis which succeeds embolism and makes the blockage more complete.

Complete rest is demanded in all cases. When a particle of fibrin has been detached from a diseased cardiac valve it is necessary to strengthen and steady the action of the heart; for irregularity and feebleness of the heart tend to increase the deposition of fibrin upon the valves, and excited cardiac action causes fibrin to be washed off into the circulation. Belladonna, strophanthus, and digitalis are the best remedies.

Embolism is most likely to occur in young subjects of heart disease, whose arterial walls are sound, and so the precautions which must be observed in cases of hæmorrhage and widespread atheroma need not, with regard to the drugs mentioned, be considered, as a rule, in cases of embolism. In cases arising from detachment of a clot which has formed in the auricle—a condition associated with exhausting illness such as enteric fever or diphtheria, or with loss of blood after parturition or profound anæmia—cardiac tonics are needed, and attempts should be made to lessen coagulability of the blood. With the latter object, transfusion of saline solution, rectal, subcutaneous, or intravenous, may be practised. When embolism is associated with septic inflammation in the pelvis or elsewhere, treatment of course must chiefly deal with such local conditions. The possibility of the formation of a cerebral abscess in such cases should not be overlooked.

* * * * * *

In conclusion, it must be added, that in most cases of apoplexy we have to deal with damaged hearts, kidneys, vessels, and morbid conditions of the blood. The treatment of such pathological states on purely physiological grounds is fallacious. As Hippocrates said, "Grave apoplexy is impossible, and mild is not easy, to cure". Recovery in a large proportion of mild cases is spontaneous, and more or less complete. Active treatment is therefore unnecessary and may be dangerous. In grave cases, treatment may be useless; yet that is no reason why it should be withheld when the symptoms and physical signs suggest rational measures for their relief. *Leonard G. Guthrie.*

APPENDICITIS.

ACUTE APPENDICITIS.

These cases fall into three groups: (1) *Those in which the disease is recognized at its onset;* (2) *Those seen by the surgeon, or in which the diagnosis is made, when the disease has spread outside the appendix;* (3) *Those with a localized abscess.*

The ideal treatment is to remove the appendix within the first few hours of onset before infection of the general peritoneal cavity has occurred. The 'mildness' of the attack should never be allowed to postpone operative interference. It is impossible to foretell the course of events; and in skilled hands the patient is convalescent, without his appendix, with infinitely less danger and in less time than if the attack had been 'medically' treated.

1. **Cases seen within the first Twenty-four to Thirty-six hours.**—Operation should be carried out at once. Aperients or enemata should not be given; no pre-operative treatment is necessary. If the patient has to be removed from home for operation, it is wise to give an adequate injection of morphia, and transport sitting up.

As in all acute abdominal cases, 'open ether' preceded by a hypodermic injection of $\frac{1}{200}$ to $\frac{1}{100}$ gr. of atropine is the best anæsthetic for general use. Chloroform should never be employed. The incision should be the muscle-splitting one in the right iliac fossa, unless symptoms point to the appendix occupying a position in the pelvis, or to its being associated with a high cæcum; in both of these cases the onset is often subacute. The opening into the abdominal cavity should be of sufficient size to allow the appendix to be

removed by sight. At this stage it is often tensely distended, and rough manipulation or an attempt to get it out through too small an opening may result in rupture and infection of the peritoneal cavity or abdominal wound. When the appendix is in the pelvis or beneath the liver, the incision should be made over the inner third of the right rectus muscle, and the muscle reflected outwards. No drainage is necessary unless perforation has occurred or there is uncontrolled oozing from adhesions. (Free fluid, clear or turbid, is often present in considerable amount in this stage; this does not necessitate drainage.) If drainage is indicated, a tube of sufficient size should be inserted.

The after-treatment does not differ from that of interval cases. The patient is propped up in bed, water is given as soon and as often as wished, and soft food as soon as inclination returns.

Complications, so common after operation in delayed cases, are rare. The death-rate is less than 2 per cent. On examining the London Hospital statistics, Lett found that of 162 consecutive patients operated upon within the first twenty-four hours in the year 1912 and part of 1913, only 2 died—a mortality of 1·2 per cent. The arguments in favour of operation within the first twenty-four hours are unanswerable. The death-rate is less than 2 per cent; the diseased organ is removed at a stage in which drainage can usually be dispensed with and a ventral hernia avoided; convalescence is rapid; and a source of danger, not only to life, but to the health of other organs, is removed.

2. **When the Disease has spread Outside the Appendix.**—When the patient is first seen forty-eight hours or more after the onset of the disease, there is still a difference of opinion with regard to the advisability of immediate operation. The 'mild' attack is subsiding; in the more severe, the disease is no longer limited to the appendix, but has spread to the general peritoneal cavity. These latter are the cases seen about the third day, the group in whom there is still the largest mortality. I am not in favour of operating 'at sight' in any but the cases within the first twenty-four to thirty-six hours and in children, in whom operation should be carried out immediately on diagnosis.

The patient should be put in Fowler's position, nothing given by the mouth, continuous salines by the rectum, with gastric lavage if necessary. If at the end of twelve hours improvement is not taking place, operation should be resorted to. In many cases, however, the symptoms subside. After the temperature has been normal for about ten days the appendix should be removed. In this way convalescence is shortened, drainage is avoided, or, if a tube is necessary, it can usually be removed within 48 hours. Many cases which seem to be almost moribund with diffuse peritonitis recover under this treatment.

In the cases needing operation, the inflammation is diffuse; many of them are what would previously have been called general peritonitis. Operation should be carried out as rapidly as possible, the appendix removed, and the abdomen drained by tube, which should be removed as soon as possible. The peritoneal cavity should not be irrigated, but any fluid present may be *very gently* swabbed up. The site of the tube or tubes must be decided at the time; it is impossible to drain the whole abdominal cavity, no matter how many are employed.

After operation, Fowler's position should be employed, nothing should be given by mouth, except water if thirst is great, and continuous rectal salines employed until vomiting has ceased and the pulse and temperature show signs that the condition is improving. If vomiting is troublesome, gastric lavage should be employed. Feeding should be started cautiously, and a beginning made with a bland liquid diet such as Allenbury or Benger's food, and the bowels left until the general condition is satisfactory. Abstinence from food, with continuous rectal salines, is the best means to combat distention. Should this, however, become very great, a full dose of pituitary extract may be given, followed by a turpentine enema in fifteen to thirty minutes. If this fails to relieve, the possibility of the obstruction being organic must be considered.

3. **Cases with a Localized Abscess.**—These comprise the late cases. In many instances of pelvic abscess the early stages of the disease were subacute.

Treatment consists in opening and draining the abscess, and removing the appendix whenever possible. The advisability of doing this in an individual case depends much on the operator, one experienced in dealing with this type of case knowing where to look for the appendix. No rules can be laid down, except that to those whose operative experience is not large—when in doubt, drain only. The position of the incision, and the

method by which the abdominal cavity is opened, must vary with each case, but it must be planned so as to be over the centre of the swelling, and to avoid dividing muscle fibres. When the abscess is pelvic, operation should be through an incision made over the right rectus muscle about an inch from the mid-line, its inner edge being defined and pulled out; this incision can be enlarged as much as is necessary without endangering nerves. When the abscess bulges into the rectum it may be drained by this route as a temporary measure. In this, as in all cases in which the appendix could not be removed at the original operation, appendicectomy should be carried out when recovery has taken place.

Removal of the appendix at the time of opening the abscess renders convalescence more rapid, ensures more thorough drainage of the abscess in that it is opened up to its whole extent, and enables the patient to return to work more rapidly and without the necessity of a second operation.

Complications.—With the more modern treatment of appendicitis, the death-rate has markedly diminished. In a paper published in 1905, I investigated the results of the treatment of the cases of acute appendicitis operated on in the London Hospital between the years 1892 and 1903. The death-rate in these years was 19·5 per cent. Lett, in a series of cases of acute appendicitis operated upon at the London Hospital in 1912 and the early part of 1913, found it to be only 4·3 per cent. The complications have diminished in an equally striking degree. The great majority arise in the second and third groups.

Residual Abscess.—A secondary rise of temperature may indicate a residual abscess A careful rectal examination should be made; if a swelling is discovered, it may usually be safely left until it can be opened from the rectum. If no pelvic swelling is present, other causes of high temperature, particularly pulmonary conditions, must be excluded, and a leucocyte count made. Subphrenic abscess must always be borne in mind (*see* Subphrenic Abscess).

Intestinal Obstruction.—This is a rare, but serious, complication which may occur in cases operated upon late. In many the obstruction is due to diffuse glueing together of intestinal coils in the pelvis, the result of peritonitis. In a few, the obstructing agent is a recently-formed band, or a portion of intestine has become kinked. When it is obvious that the obstruction is mechanical, operation should be undertaken, the adhesions separated or the band divided, with drainage of the intestine if this appears necessary.

Fœcal Fistula.—This is rarely met with except after operation in cases of localized abscess. Spontaneous closure is the rule. Occasionally, when extensive necrosis of the cæcum has occurred, it is necessary to close it by operation.

Pylephlebitis (*portal pyæmia*).—While this has always been an unusual complication, it is becoming rarer as removal of the appendix in the first few hours of the attack is becoming more common. In the cases in which it occurs, the attack of appendicitis is often so mild that the liver condition entirely overshadows it. The appendix should be removed if this has not already been done, and the liver explored. Any abscesses discovered should be drained. Several patients have recovered under this treatment.

Post-operative Hæmatemesis or Melæna.—This is a grave complication which sometimes occurs, and is usually due to acute ulcers or erosions of the stomach or duodenum. In a few cases the bleeding arises in a chronic ulcer from the spread of the inflammation. Operative treatment should never be undertaken.

CHRONIC APPENDICITIS.

The term 'chronic' is used to include all those cases of disease of the appendix in which the attack does not cause the patient to seek medical aid for an illness confining him to bed.

The pain in chronic appendicitis is not localized in the right iliac fossa—and if here, its principal seat is elsewhere. Less would be heard of failure to cure by removal of the appendix if we were sceptical of the appendicular origin of pain limited to the right iliac fossa. Pain and tenderness starting in and around this region rarely own this cause, and the appendix should never be removed for continuous pain here. In every case of suspected chronic appendicitis, every method of examination should be employed in order to come, if possible, to a definite diagnosis.

There are two groups: (1) *With attacks of pain at irregular intervals*; (2) *With dyspepsia.*

1. With Irregular Attacks of Pain.—The characteristic signs here are attacks of pain at irregular intervals. The pain is usually umbilical, epigastric, or sometimes left iliac. If seen during an attack, deep tenderness can be discovered in the right iliac fossa, or per rectum.

The appendix should be removed through a muscle-splitting incision in the right iliac fossa, unless from the physical signs or symptoms it is considered to be pelvic, when it should be removed through the incision previously described, in which the lower right rectus is pulled outwards.

2. With Dyspepsia.—In this group, even if a tentative diagnosis is made, it should never be acted upon alone, but the whole abdomen should be explored through an incision pulling the right rectus outwards.

The diagnosis of appendix dyspepsia should only be definitely made after the stomach, duodenum, and gall-bladder have been explored. Unless this is done, chronic ulcer and gall-bladder disease may be overlooked, and a second operation becomes necessary.

James Sherren.

ARRHYTHMIA.—(*See* HEART, IRREGULARITY OF.)

ARTERIES AND VEINS, WOUNDS OF.—(*See* WOUNDS OF ARTERIES AND VEINS.)

ARTERIOSCLEROSIS.—(*See* ATHEROSCLEROSIS.)

ARTHRITIS DEFORMANS.—(*See* RHEUMATOID ARTHRITIS.)

ARTHRITIS, SUPPURATIVE.—When a joint cavity has become infected, as shown by the constitutional symptoms and by the character of the fluid withdrawn by an exploring syringe, the form of treatment that will yield the best result is still a matter for discussion.

1. For mild infections, or for early cases, aspiration of the joint and the injection of formalin and glycerin 2 per cent should be tried. The formalin should be added to the glycerin, 10 min. to 1 oz., twenty-four hours before use, and shaken so that the irritant formalin is well diffused into the glycerin. About 10 to 15 c.c. should be used for the knee-joint of an adult. The principles of this treatment are that the formalin is capable of destroying a certain number of bacteria, while the solution excites an active migration of leucocytes, and further has the effect of blocking the lymph channels so that systemic absorption is checked.

Recent experience in military surgery has shown that the joint tissues are much more resistant to infection than was supposed, and many cases can be treated on conservative lines, with the result that a mobile joint is obtained.

2. If the above method fails, or the infection appears to be of great virulence, the joint must be opened and flushed out with saline and some antiseptic solution such as Dakin's solution, chloramine, or eusol. All the evidence obtainable goes to prove that the introduction of tubes into the joint is useless from the point of view of obtaining drainage, and that after about twenty-four hours the tubes are draining their own track only, as in the case of the peritoneum. In order, therefore, to allow the escape of the pus, it is better to suture the opening in the *synovial membrane* to the edges of the skin wound. Carrel's tubes may be introduced, and the joint flushed with Dakin's solution until bacteriological and clinical evidence satisfy the surgeon that the infection is controlled.

While this treatment is in progress, many surgeons advise firm splinting of the affected joint in such a position that should ankylosis ensue the joint will be of the greatest use to the patient, i.e., hip extended with slight abduction, shoulder abducted, elbow at right angles, knee nearly straight; but there is certainly reason to believe that the use of passive and active movements in some acute joint infections will be followed by a speedier recovery and, moreover, a recovery with movement. Obviously this treatment can only be employed in selected cases under special supervision; but it is based on the fact that by movement the purulent exudate is readily expelled from the joint through the opening made in the synovial membrane, and adhesions are prevented from forming. As soon as it is clear that the acute inflammatory phenomena have subsided, massage

and passive movements may be undertaken. We would point out that, contrary to what is often stated, a considerable amount of movement may be regained in these cases, if an operation is performed early, and if drainage is not prolonged. At the same time, this treatment requires the greatest care and discrimination, and if movement is followed by pain, swelling, and rise of temperature, it must be stopped. In the worst cases, where the bones are damaged and constitutional symptoms are severe, or where previous drainage has failed, excision or amputation will be required.

Excellent results have been obtained by the use of Bier's method of passive congestion (q.v.) in cases of suppurative arthritis. *W. H. Clayton-Greene.*

ASCITES.—(*See* CIRRHOSIS OF LIVER.)

ASPHYXIA.—(*See* DROWNED, TREATMENT OF THE APPARENTLY; LARYNGEAL OBSTRUCTION; POISONING.)

ASTHENOPIA.—The symptoms of pain in or about the eyes, headaches following the use of the eyes, or the running together of print when reading, should lead to a careful examination of the eyes. Organic disease, either of the media or fundus, must first be excluded. (*N.B.*—The conjunctiva should be looked at critically for signs of any chronic inflammation, especially of follicular conjunctivitis, and astringents ordered if necessary.)

1. The refraction should be tested, and the correction for any hypermetropia, myopia, or astigmatism given. If the headaches are experienced both in distant and near vision, the correction of any hypermetropia or astigmatism should be worn constantly. Myopes may prefer their distance correction for general use, but if they have asthenopic symptoms they are usually more comfortable for close work either (*a*) with an under-correction, or, (*b*) when the myopia is less than 3 D and equal in the two eyes, with no glasses at all.

2. The external muscles should be tested for *insufficiency* with the Maddox rod. If there is *exophoria*, a prism with the base inwards is often of great assistance for close work. With *hyperphoria*, a vertical prism slightly under-correcting the defect may give invaluable help. It must be remembered, however, that only a small proportion of the muscle defects which are found give rise to symptoms, and therefore it is only these which call for correction. It is a good rule, where glasses have not previously been worn, to order at first the lenses correcting the refraction error alone, and to add the prisms at a later date if the asthenopic symptoms have not been alleviated.

3. The general health of the patient is a very important factor, and should be carefully looked into and treated, especially in regard to anæmia, constipation, and neurasthenia.

4. The conditions of work must also be attended to. See that the head is kept in a proper, upright position; that the work is held well away, not nearer than 14 inches; that there is good illumination coming from the left side; and that, when reading, good print is used. *W. Tindall Lister.*

ASTHMA, BRONCHIAL.—Asthma arising as the result of heart or renal disease will be dealt with under those headings. Idiopathic or bronchial asthma will be considered here.

It has been abundantly shown, by experiment, that bronchial asthma can be produced by spasm of the bronchial tubes, though there are still many who believe that in some cases the symptoms are produced by a rapidly oncoming œdema of the bronchial mucous membrane, a sort of urticaria of the bronchial tubes. Moreover, it is evident that, although everyone possesses the mechanism for the production of asthma, only a few suffer from the spasm; and that therefore there must be an underlying sensitiveness to stimuli capable of acting on this mechanism in the asthmatic.

Treatment has consequently turned upon:—

(1) *The attack or spasm* (or œdema); (2) *The underlying tendency*; (3) *The removal of the cause.*

1. **The Treatment of the Spasm.**—To give a complete list of all the remedies which have been reported as successful in the treatment of this complaint would be confusing. There is probably no condition in which so many drugs have been used; and it must be said, at the outset, that a remedy which is immediately successful in one case may have

no effect in another, and further, may prove quite useless in the same case at another time.

Morphia we should place first, as of most value for the rapid relief of the distressing dyspnœa, and its effect is often increased by the addition of atropine. These should be given together as a hypodermic injection (morphia $\frac{1}{6}$ to $\frac{1}{3}$ gr., atropine $\frac{1}{120}$ to $\frac{1}{60}$ gr.).

Caution.—Morphia should not be given where there is considerable bronchitis, or in old people, and on no account where there is kidney disease. The danger of the formation of the 'habit' must be borne in mind, and for that reason it is important not to leave the treatment in the hands of the patient; and if the case is one where the attacks are of very frequent recurrence, and the necessary dose has to be increased, it would be wise to seek a less risky means of relief.

Inhalations and fumigations have been largely used. Chloroform is often very efficacious, but the relief is generally very transient. Much the same may be said of ether. These are remedies which should never be left in the patient's own hands. Nitrite of amyl, in some cases, gives temporary relief, and the capsules of nitrite of amyl and chloroform, combined, are sometimes even more efficacious (it is well to remember that less headache will follow its use when it is inhaled through the mouth instead of through the nose).

Much more generally useful and more lasting in their effects are the inhalations of certain fumigations. Tobacco is successful in some cases (when not used habitually). Nitre paper is perhaps one of the commonest remedies, and often gives early relief; it must be used freely so as to make the air of the room dense with its fumes. Many papers are used which contain, in addition to nitre, numerous other drugs, such as the iodide and chlorate of potash, and powdered digitalis, stramonium, and lobelia leaves.

'Himrod's cure' is a well-known powder, very useful in many cases. Its success has given rise to various imitations. Its chief ingredients are probably lobelia, nitre, green tea, and stramonium. Cigarettes also are made containing any of the above-mentioned drugs, and arsenical cigarettes are found to give relief in some instances. With these remedies the dose has frequently to be increased, they often leave bad headache, and they sometimes seem to irritate, or at any rate increase, any attendant bronchial catarrh. The fumes often irritate and cause fits of coughing even when they give relief.

Asthma is a pulmonary neurosis, closely allied to other neuroses, frequently met with in families in which other members suffer from migraine and allied affections. It is, therefore, not surprising to find many remedies which are of service in the treatment of migraine equally so in cases of asthma. Thus, strong tea (or Guarana tea), coffee, or, better, citrate of caffeine, phenacetin, phenazone, and acetanilide, will, one or other of them, sometimes act like a charm. Of this class of remedies it must be said that they frequently lose their power, and it will often be found that where they relieve the spasm, their use is attended by great sleeplessness; in some cases, sleeplessness alternates with asthma, and is a most difficult symptom to combat. Alcohol must be mentioned as a remedy, because it is often so quickly efficacious. The objections to its use are obvious, especially when the attacks are frequent.

Lately subcutaneous injections of some preparation from the suprarenal gland have been found very successful in cutting short an attack. Whether its action is by preventing the (theoretical) œdema of the bronchial tubes, or by blanching the nasal mucous membrane, or in some other way, is not decided. However it acts it is a treatment that can be recommended—1 to 3 min. of 1–1000 adrenalin chloride solution to be injected subcutaneously as soon as the attack commences, or by the application to the nasal mucous membrane.

Lastly, the induction of vomiting, or at least nausea, is often attended by instantaneous relief of the spasm. Tartrate of antimony and potassium, $\frac{1}{25}$ gr. in water, every half hour till nausea is produced, is perhaps the best of such remedies. Sometimes the relief may be due to the emptying of an overloaded stomach, which has acted as a cause. Some patients will bring on vomiting by tickling the back of their throat, or it may be produced by an ordinary emetic.

2. **For the Underlying Tendency.**—The actual attack having passed off, it becomes necessary to lessen the frequency of its return, by reducing the sensitiveness of the

mechanism to outward stimuli. Many of the remedies mentioned under this heading will be found useful even during the attack, but their chief aim is directed towards permanently curing the patient, or at any rate lengthening the period of freedom from attack. The two drugs which are found most generally useful are iodide of potash and arsenic. They can be given separately or together, but in any case a prolonged course is advisable. Some patients, who are very intolerant of the iodide, will stand arsenic well, and the prescription of bismuth with the latter will often prevent the gastric irritation so frequently seen as a consequence of its administration. Opium, belladonna, and lobelia are also of service as preventives, and are generally given in combination with arsenic and potassium iodide. Several cases have been permanently cured by the application of electricity to the neck: it is supposed that the current blocks the vagi, and so prevents the conveyance of irritating stimuli. What has been called the pneumatic treatment, elaborately carried out at Reichenhall and Meran, certainly materially benefits a large number of chronic cases. Briefly, the treatment consists in alternately inspiring compressed air and expiring into rarefied air. It is of little use in the acute condition, but where, as the result of repeated attacks, bronchial catarrh and emphysema have resulted, it is most useful.

Of all the preventive treatments so far mentioned, undoubtedly the greatest reliance should be placed on a prolonged course of arsenic and iodide.

One is sometimes asked what inoculation treatment is to be recommended for asthma. There is none that can be relied upon for the attack itself. As a possible preventive treatment one would say this: In a certain small group of cases catarrh is a common cause; whenever the patient gets a 'cold' an asthmatic attack is liable to supervene. In such cases it has been suggested that, in order to lessen, or prevent, the tendency to catarrh, vaccination with one, or all, of the catarrhal organisms should be performed.

3. **Removal of Cause.**—There is, perhaps, no disease in which the removal of the cause is so immediately attended by the subsidence of all symptoms. One admits the difficulty, in many cases, of fixing on the true etiological factor; also that, in others, any of several causes may be sufficient to start an attack; nevertheless one is convinced that, in the majority of cases, a definite cause, or causes, can be found, and their removal be attended by the most beneficial results. In one it may be a chill, the slightest bronchial catarrh being accompanied by asthma; in another it may be an overloaded stomach or bowel, or some other source of peripheral irritation, such as worms, teething, or skin troubles. Asthmatic attacks are seen in gouty people when they are most gouty, and so forth.

But of all causes, those which are found in, or come through, the nose and throat, are the most likely to give rise to attacks. It therefore becomes essential that the curative treatment of asthma should commence with a careful search for the cause. The nose, mouth, and throat should be examined for adenoids, rhinitis, enlarged tonsils, delayed and painful teething.

Careful notes should be kept by the patient, or friends, as to the circumstances which give rise to the trouble, so that, by a process of exclusion, the true cause may be discovered. These causes are very various, the smell of birds, cats, dogs, horses, certain flowers, fumes, dust, etc., having all at one time or another been shown to initiate an attack.

General and Climatic Treatment.—Asthmatics are generally very susceptible to climatic influences. Many are always free in large towns, others only in country districts or at the seaside. Curiously enough, a sufferer will sometimes be quite free from his trouble for some time after first moving into a fresh district, and subsequently the attacks will return, or the reverse may be the case. As a rule such patients are freer from trouble when in large towns. Moderate altitudes are often beneficial, but care must be taken not to send patients, in whom long-continued asthma has given rise to emphysema and cardiac dilatation, to mountain resorts. Indeed, where bronchial catarrh and emphysema have resulted, these call for greater consideration than the asthma, and such cases do well to winter in warm, sunny, seaside places, an equable, moist climate being the best.

From what has been said, it will have been gathered that the diet often needs careful consideration; dyspepsia must be treated and constipation avoided.

The following prescriptions are suitable for the treatment of such cases:—

FUMIGATION FOR THE ATTACK.

℞ Pulveris Belladonnæ Foliorum
Pulveris Hyoscyami Foliorum
Pulveris Stramonii Foliorum
Potassii Nitratis āā Partes Æquales

M. Half a teaspoonful to be burnt for each fumigation.

(*Vict. Park Hosp. Pharm.*)

℞ Stramonium Leaves
Green Tea āā ℥iv
Lobelia ℥iss

Mix, and pour on the mixture enough saturated solution of nitre to wet it. Dry it and keep in closely stoppered bottle. (*Plant.*)

℞ Daturæ Tatulæ
Stramonii Foliorum
Cannabis Indicæ āā ℥ij
Pulveris Potassii Nitratis ℥ij
Olei Eucalypti ℥ss

Mix thoroughly. (*Woodward.*)

ANTI-ASTHMATIC MIXTURE.

℞ Potassii Iodidi ℥ij
Liquoris Fowleri ℥j
Vini Ipecacuanhæ ℥iv
Tincturæ Hyoscyami ℥iv
Aquæ Chloroformi q.s. ad ℥viij

M. ft. mist. A tablespoonful in water three times a day after food. (*Whitla.*)

MIXTURE FOR ASTHMATIC PAROXYSM.

℞ Tincturæ Lobeliæ Æthereæ ℿxv
Potassii Iodidi gr. v
Potassii Bromidi gr. iv
Spiritus Ammoniæ Aromatici ℿxx
Syrupi Tolutani ℥j
Aquæ Camphoræ q.s ad ℥j

ANOTHER DRAUGHT FOR PAROXYSM.

℞ Tincturæ Cubebæ ℥v
Ammonii Bromidi ℥ij
Spiritus Ammoniæ Aromatici ℥ij
Spiritus Ætheris ℥iss
Tincturæ Lavandulæ Co. ℥iij
Spiritus Chloroformi ℥iss
Aquam ad ℥vj

One-sixth part for dyspnœa.

ANTI-ASTHMATIC PILL.

℞ Sodii Arsenatis gr. $\frac{1}{15}$
Extracti Nucis Vomicæ gr. j
Extracti Belladonnæ gr. ¼
Extracti Gentianæ q.s. ad gr. iij

M. ft. pil. One pill twice daily after food.

W. J. Hadley.

ATHEROSCLEROSIS* is not a clinical but a pathological name. The arterial tree, as a whole or in parts, may undergo injury or deterioration in the course of more than one series of morbid events; moreover, however closely in the advanced stages the diseased vessels may resemble each other in their superficial, or even in their histological aspects, it is probable that the intimate process of damage or decay is not uniform. If, towards the end of their life, they all abut upon a common form of decay, there may be nevertheless, and probably there are, several processes of initiation, each with its own primary pathological features.

In this article we have no direct concern with the histology of the subject; yet, as the kinds of disease leading to such damage or decay of the arteries are several, each must have its own way, and its own means, of therapeutic aid. I know of no such discrimination of the kinds of arterial disease but my own; this therefore I must use, as follows:—

1. Atherosclerosis, the effect of persistently high blood-pressures (Hyperpietic).

2. Atherosclerosis, the effect of certain infections, such as syphilis, typhoid fever, lead, diabetes, etc. (Toxic). In many of these the blood-pressure is not necessarily or usually increased, if at all; in others, such as lead, it is raised throughout.

3. Atherosclerosis, the effect of senile involutionary changes (Decrescent). In this form, again, the arterial pressures do not exceed the quasi-normal increase general in later life, unless the first process supervene upon the third, as not infrequently it does, but usually for relatively short periods.

It is evident that these several processes, as they arise in different ways, must be counteracted by different methods.

* Without Bright's disease.

1. HYPERPIETIC ATHEROSCLEROSIS (HYPERPIESIA).

Here the increase of peripheral resistance, upon which the rise of pressure depends, is of obscure origin. The immediate cause is increased friction, and this can depend only upon a narrowing of the vessels themselves, or upon an increase of viscosity of the blood ; or of course upon a combination of these factors. Russell Burton-Opitz and later investigators have shown that the viscosity of the blood varies considerably, but depends mainly on the number of its corpuscles ; on the other hand, we know also that the arteries may contract persistently over areas large enough to maintain a considerable rise in the general pressure. In health, wide constrictions are neutralized by dilatation elsewhere, as in the splanchnic area ; but we may suppose that the splanchnic may itself be the area of constriction ; or the compensatory mechanism may be liable to get out of gear, or become 'labile'. The proximate cause of such arterial constriction may come from without, or be a product of distempered metabolism, or an intoxication by refluent waste products ; that some such poisons exist, poisons which act upon the vasomotor centre or widely upon the vessels themselves, has long been suspected, and is now supported by some proofs.

Although my text is atherosclerosis, and hyperpiesis in children is rarely protracted enough to produce this injury in young vessels, yet our outlook on the matter would be imperfect did I not at least allude to transient manifestations of excessive blood-pressure in them ; for we may be dealing with processes essentially the same. Indeed, even in children, frequent or persistent morbid excess of pressure produces some static change, though it is rarely permanent. The radial artery may thicken ; but as, after some uncertain time, it returns to its normal state, the transient thickening probably consists only in a hypertrophy of the media, which, with the return of health, disappears. Children so affected are usually pasty-faced, dark under the eyes, sickly, headachy, and at one time sluggish and moody, at another fretful and excitable. Their tongues are sticky and dirty, the breath is foul, the bowels are irregular, and the epigastrium and abdomen tumid. Often, on manipulating the abdomen, squelches, if not true splashes, are elicited too easily. In these cases the rules of treatment, empirical as they are, are promptly efficacious. The diet must be restricted, particularly in respect of fats, sugars, meat, and strong broths. Even milk may be given too liberally in these cases, especially in its natural state ; for a child of ten years of age thus disordered, one pint of milk, prepared in one way or another, is sufficient for the twenty-four hours. Indeed the quantities of food must be moderated in all directions, for the mother is too apt to stuff the child, or the school-boy to stuff himself. During the ailment, three or four rusks and a cup of milk are enough for breakfast ; a little light broth, with a biscuit, may be given in the forenoon, and at dinner some plain white fish, or chicken, with but little potato, and a light pudding. Full plates of farinaceous or stodgy puddings are to be forbidden, as flatulent and clogging to the digestion ; light steamed bread puddings, a little blancmange, junket, and the like, are to be preferred. Tea to be as breakfast, rusks or dry toast being better than thick slices of bread. Butter is to be given scantily ; fruit, raisins, currants, jam, cakes, not at all. Some milk food will make a sufficient supper. The temperature in these cases sometimes rises a little in an irregular way ; where this is so, the food should be even more sparing for the time, and but little of it solid. When feverish, the patient must stop in bed ; otherwise he is better about, gentle exercise out of doors being allowed.

Of medicines, mercury is the chief. It may be administered as calomel or as grey powder ; grey powder is the form of which I have most experience. Under the use of fractional doses the breath sweetens, the actions of the bowels become more normal, and the stools less offensive. For a child of ten, a quarter of a grain of grey powder thrice daily may be ordered, and this in repeated periods of four or five days. The mouth must be closely watched, and kept very clean. If the drug produces two motions a day we need not hold our hand ; but if mucus becomes evident in them, the remedy should be reduced or suspended. As the tongue cleans, and the other symptoms are mitigated, a bitter stomachic mixture may be administered. Children dislike bitters, but they are efficacious, and if pleasantly flavoured will be taken readily by well-disciplined children. They should be given before the meals. The diet may now be cautiously enlarged, but fats, sweets, and even starches are to be given with a sparing hand.

These children are often of nervous stock, and their ailments may be coloured by whims and ill-humours; still, the disorder must fundamentally be one of the *primæ viæ*. When thoroughly clear of the disorder, it is helpful to give these patients cod-liver oil; during the colder months of the year this fat is so well digested by the young that it may displace with advantage some of the other 'rich' elements of the dietary. Under this kind of management the full sustained pulse and obtrusive artery gradually subside. This is one variety of arterial disorder; there are others for which we have as yet no explanation. Latent infections may be concerned in them. When the vessel returns to its normal tenuity I cannot say, as one loses sight of the patient before this comes about; but if some years later an opportunity arises for a re-examination, it will be found, should the amendment have been maintained, that the walls of the vessels have returned to their normal condition. The morbid alteration, as I have said, may lie in an increase of the muscular tissue only. Whether such children are more apt than others to fall into the hyperpietic disorders of later life, I am not yet able to say.

In hyperpiesia of the adult, the symptoms are probably of like nature. Unfortunately, so apt is the bodily system in adjusting itself to abnormal conditions, hyperpiesia often establishes itself in the adult without betraying its presence. Indeed high-pressure in the cerebral vessels may give rise, for a time, to a sense of well-being. A man of middle life, when, for a skin eruption perhaps or for life insurance, he comes to a physician, may report himself to be in excellent health; yet the wary practitioner may discover an arterial pressure of 160–190 mm. Hg. The radial artery may be already a little thickened, and the left heart enlarging. If the man, who had regarded himself as healthy, will submit on trust to a long, close, and troublesome medical treatment, and much irksome management of his diet and habits, it may still be possible to restore the health more or less completely. On the other hand, to continue in this disorder for some years will lead to death by apoplexy or by heart failure; even if life be not cut short sooner by an acute pneumonia or other intercurrent disease.

The patient may then get rid of his plethora and his cardio-arterial strain, if he will pay the price. But at a somewhat later stage the outlook is not so hopeful; the circulation —heart and vessels—may have acquired a permanently abnormal set, and a restoration of the normal balance be no longer practicable. In such a state, to try to reduce the arterial pressures to the normal mean disturbs the artificial without re-establishing the original balance, and the treatment is not completely successful; it becomes a compromise: yet the compromise may suffice, in moderate cases, to keep the disorder at bay, to postpone or prevent an apoplexy, and to husband the resources of the heart.

Happily in these cases the heart is usually of good quality; its coronary circulation, until embarrassed by atheroma, is at high pressure; and even in advanced atheroma, if the progress of the disease be gradual, the nourishment of the heart, stretched and strained as the organ may be, is kept up, somehow or other, with a wonderful steadiness. The term 'cardiosclerosis' is a specious ambiguity. Under it such patients are indiscriminately accused of 'a weak heart', and are treated on this line. Yet these 'weak' hearts are often staggering under systolic pressures of 200–240 mm. Hg! Our treatment of 'weakness' of this kind cannot be that of a heart failing intrinsically under ordinary or low pressures. Enlarged such hearts certainly are, and sooner or later, if an apoplexy be averted, will be defeated; but commonly such over-driven hearts hold on heroically. With caution, and at certain moments, the physician may need such cardiac stimulants as digitalis or strophanthus; yet his main duty is not to spur the heart on, but to relieve it of its enormous burden. For even if recovery of the normal adjustment be past hope, much may be done to maintain for a while some degree of equilibrium.

In early and late stages of hyperpiesia the method of cure is in principle the same. In many instances the rise of arterial pressure is due to excess of food, positive or relative. The subjects of this plethora, large eaters as they may be, may not be fat, nor ruddy; often they are so, but not a few are even lean and sallow. In others, however, the intake has not been more than many persons dispose of easily—individuals vary widely in their capacity for disposing of excess of food—but has been more than the individual capacity. Many of these persons, in both categories, if they do not present a personal history of gout, yet come of gouty stock, and are wont to regard themselves as gouty. Moreover, treatment directed against the supposed gouty habit, especially a spa treatment, often

answers to expectation. If the man be fat, he must gradually reduce his intake till he brings himself back near the normal weight of his earlier years—say to his weight at forty. To bring the food down gradually, even to half the quantity habitual to the individual, has in many cases the happiest results. It is found that confinement to bed during the severer reduction of the alimentation is efficient in moderating pressure and averting debility. Alcohol alone does not seem to lead to atheroma, yet in conjunction with other causes—as, for instance, with lead poisoning—it has a strong contributory influence. The same may be true of tobacco. Alcohol therefore must be cut out, or reduced to a nominal amount—some persons find in whey a pleasant and harmless drink ; tobacco must be strictly moderated, especially if there be any cardiac arrhythmia. As regards the chief classes of food temperance should be observed, especially of course in respect of the nitrogenous, and of those which contain purins. But in most cases the main purpose is the restriction of the whole intake. Certain persons, however, are so little able to convert, normally and completely, even moderate quantities of food, that an abstemious diet fails to avert or to dissipate pressures morbidly high. Some of these patients are indeed of sedentary habits, such as well-to-do ladies and closet students, for whom ordinary quantities of food are relatively excessive, or whose excretory functions are sluggish. Although Chittenden's researches suggest that mental work makes a remarkably small demand on food, yet, unfortunately, sedentary mental work in towns seems to create a false sort of appetite. The standard of the real needs of the body must, more or less, be regulated by the scales ; but in spare persons who are not large feeders we must be guided by the progress of the case, and by clinical observation. As in eating, so in drinking, many persons are prone to excess. Thirst, like the appetite for food, acquires strength by indulgence ; and the practice of moderating the consumption of fluid, especially at meals, is often a good one. Coffee and tea, which raise arterial pressure, should be used discreetly.

To turn now to the fate of the food : we assume by the abiding high pressure that metabolism is imperfect or perverse, or that its organs are under strain, or that waste proteids or their amines or other results are reabsorbed. Although it is an error to suppose that an annual six weeks' cure can take the place of a systematic, patient, and persistent regimen, yet from spa treatment, as for instance at such resorts as Harrogate, Llandrindod, Carlsbad, Marienbad, Homburg, good results are obtained. The choice of the spa and the course of the cure must be adapted to the individual case. A course of waters, with the customary concurrent conditions and a certain decision of purpose, may be carried out at home and repeated from time to time as the symptoms and the functions of bowel and kidney may indicate. Of single drugs in these states, none is to be compared with mercury, especially—for those who tolerate it well—calomel ; for others, blue pill. The calomel is to be given in fractional doses, say $\frac{1}{4}$ gr. or a little more, once, twice, or thrice daily for four or five days ; the course to be repeated from time to time. The patient soon learns when to repeat the course, and recognizes the benefit to be had from it. In the intervals, small frequent doses of podophyllin—$\frac{1}{10}$ to $\frac{1}{4}$ gr. thrice daily—of euonymin, or of iridin, may be prescribed. From day to day some notion of the effects may be guessed at by the finger, but the diastolic blood-pressure should be measured at least once a week.

Of venesection for hyperpiesis I have some increasing knowledge. I have had under observation for some years a few patients who are bled at least twice a year. They look forward eagerly to the operations, and declare that the discomforts of excessive pressures are marvellously relieved by them. The same effects I have witnessed, in a more occasional way, in patients seen and then lost sight of. A permanent improvement seems to be thus maintained ; but some of them were beyond the stage of cure, though not of substantial amelioration. In such instances, which they recognized by the tight pulse, our forefathers were wont to take blood freely and periodically, and I believe with great benefit. Still, venesection is at best but palliative.

Vasodilator drugs, when the pressures are acute and urgent, have some, but not a predominant, part to play. To prescribe them continually is, I am sure, a mistaken practice. Sodium nitrite is effectual, but is not easy to prescribe, and is so variable in standard that although at one time a small dose may seem too prompt in its effects, at another a dose three times as large may seem inert. Where symptoms seem to call upon all our resources we may prescribe this drug with a few grains of potassium nitrate ;

potassium iodide is incompatible with it. But it is rather by mercurial alteratives—the good effect of which is so well and quickly felt as often to provoke exclamations of gratitude from these patients,—saline laxatives, and a modified diet, that we shall succeed in alleviating the heavy stress on the whole arterial tree. Calcium salts have remarkable physiological effects both positive and negative, but we know too little of their ways to guide us in their use. It is generally desirable in cases of high pressure to regulate the ingestion of chloride of sodium; sometimes even to withdraw the salt for a few days. Thyroid extract I have tried perhaps inadequately, at any rate with no great success. My doses may have been too small.

Diaphoretic methods, at first sight likely to be useful to such patients, are, in my experience, disappointing. I have tried hot-air baths, such as the 'Turkish', hopefully, carefully, and perseveringly; but they neither give relief to the patient (often indeed they cause discomfort), nor establish any abiding reductions of blood-pressure. Now I do not use them, nor any other baths. The 'Nauheim methods' are not generally required in these cases; the heart, if it can have fair play, is good enough; nevertheless, in occasional cases, after reducing the mean blood-pressures, baths and exercises and digitalis may be of use in helping a weary heart back to more normal diameters. Emphysema of the lungs, more frequent in the decrescent class, may add to our difficulties in hyperpiesia.

It is of the utmost importance to search out and remove any possible source of autotoxins, such as bad teeth, infected tonsils, and the like.

When the patient has begun to suffer from cardiac dyspnœa, and dilatation is advancing towards mitral regurgitation, we must recognize the unwelcome truth that the heart is undergoing defeat; a substantial and permanent restoration of cardio-arterial balance is not then to be hoped for; on the contrary, fall of pressure by heart failure is to be feared. Then the pulse usually rises in rate. Something may yet be done, but too many leaves have been torn out of the book. Diuretics such as theobromine have their value, especially when the urine is of high specific gravity, scanty, and lateritious. Patients of the class now under discussion do not present the nausea, headache, epistaxis, retinal changes, and other symptoms of Bright's disease; but polyuria and some albumin, with few or no granular casts, are frequent features.

It is then in the first stages of the malady, in sound subjects, when the abnormal pressures are not of long standing and the consequent ill-effects upon the heart and vessels are incipient, or even yet to come, that cures are to be made. Periods of from five to ten years, according to morbid incidence and individual equation, may elapse without permanent strain. In the curable stage, unless the peripheral resistance be unusually high and obstinate, there are better methods for the restoration of the circulation than artificial baths and exercises; namely, natural exercise. In such cases—and we should now be catching them earlier and earlier—patients are to be encouraged cautiously to take more and more exercise. When the heart has been relieved of stress, and is pulling itself together, gentle games may be recommended, especially such as do not require sudden efforts. Gentle cycling on the level, quiet walking, even up the lower hills, golf, and so forth are useful. The efforts of tennis, even of the lawn variety, are too sudden. It is of enormous advantage if we can throw open the vast muscular areas of the blood currents, thus lowering resistance and washing away impurities. Then, if all goes well, for patients disposed to recurrent hyperpiesia, but in whom the vessels betray as yet no considerable signs of lesion, there is no medicine like regulated hill-climbing. When a healthy man essays to climb a hill, he will find that, during the first two or three minutes, the radial artery maintains its calibre; so probably do the chief arterial areas in the body. During this period, exertion tends to raise the pressure, embarrass the breathing, and throw additional stress upon the heart. But on proceeding cautiously, the radial artery dilates, not gradually but rather suddenly, perhaps to twice its lumen; this signifies, no doubt, the opening of other large arterial areas also; therewith pressure falls, and the respiration relaxes; we get, as the phrase goes, our 'second wind.' During the initial period no precaution can be too great; but after this expansion the walker will proceed with more and more ease. How far this searching but efficient method may be applicable to a particular case must depend on the discrimination of the physician. Every person from the age, let us say, of forty-five, would be wise to have his arterial pressure measured

every four or five years ; oftener, if it be found above the mean for the period of life, or if morning depression of spirits, disturbed sleep, constipation, biliousness, or other vague feelings of disorder suggest that the exchanges and discharges of the body are falling short of perfection. Upon him who comes of a family in which gout or apoplexy has appeared such counsels are the more incumbent.

For cases too far advanced for natural exercise, as indeed for the initiatory stages of milder cases, massage is very useful ; more useful, perhaps, than artificial exercises. If not done rudely, but with a gentle, patient manipulation, the muscular areas are opened, and stagnant humours expelled. Probably the flow of lymph is favoured and accelerated. Warmth and massage may be directed especially to the splanchnic area. Oliver recommends the Aix douche-massage, followed by a needle bath of alternating temperatures, and warm pack. Hydropathy, carried out vigilantly and scientifically, as on Winternitz' principles, is probably very useful in high-pressure cases. Personally I have little experience of these methods ; we seem to fall short of scientific practice of the kind at home, and German ways of life are unsuited to the habits of most of our countrymen.

In all these rules of exercise the patient must at once report any sensation of tightness or oppression behind the sternum which signifies rises of pressure beyond the toleration of the aorta. This sense of oppression on exertion may soon pass into manifest angina pectoris.

Of the effect of the high-frequency current in reducing excessive arterial pressures I have now considerable, if second-hand, experience. In many cases in which it has been tried for me, I have been led to think it had a good and abiding effect in this direction. Until diastolic blood-pressures are more systematically measured by therapeutists, their reports will be incomplete ; but in some of my cases these methods have been carefully observed. Dr. Lewis Jones, who has also procured relief in high-pressure cases from high-frequency currents, attributed the relief to 'diathermy'. The 'dosage' of the current is of great importance ; probably the doses in general use are too weak. No other form of electricity is serviceable.

In respect of climate in hyperpiesia, I have little to say which will not be supplied by the common sense of the reader. In high-pressure cases it is well, as a rule, to advise the patient not to exceed altitudes of 3000 ft. at most ; but in vigorous and undamaged subjects with a proclivity to high arterial pressure, who can gradually be trained to hill-climbing, the heavy sweating in the dry evaporating air of the Alps has a remarkable effect for good. Even in these cases, however, brief stages at lower altitudes should intervene. It is in the involutionary form of atherosclerosis that mildness and equability of climate, as in the Riviera, are specifically important.

Not a few cases in the early stage of hyperpiesis are diagnosed falsely as 'neurasthenia' ; but a close examination of the heart, and a measurement of the arterial pressures, should distribute them to their proper categories.

When, at last, the heart is worn out by the intolerable stresses under which it has been permitted to suffer ; when it yields in its walls, leaks at its valves, and is giving up the unequal strife, the treatment falls into line of like events arising from primary diseases of the heart, which are described elsewhere in this work.

2. TOXIC ATHEROSCLEROSIS.

It would be impossible to enter upon the infinite methods of treatment of the various infections which may issue in atherosclerosis. It is presumed that the aortitis of syphilis is more likely to supervene in cases in which specific treatment has been neglected or perfunctory, and the best must be made of a belated effort. Salvarsan may prove to be of invaluable service in syphilitic diseases of the aorta and of the peripheral (e.g. cerebral) vessels. For other distempers, too often we have no direct antidote ; the cure must be indirect. In the arterial disease of typhoid fever, for instance, the patient must, if possible, be restrained from the full use of body and mind until, presumably, the poison is eliminated and neutralized. The long survival of the specific bacillus in these patients is now well known. We have as yet little knowledge of the ultimate history of such cases. My impression is that in these atherosclerotics life is not so much abbreviated as impaired in its energies. In most of the toxic cases the

blood-pressures are not raised, and we have not this guide to the degree of disease or amendment. Similar considerations apply to the atherosclerosis of diabetes, or of lardaceous disease, in which, again, there is no rise of pressure. In toxic cases such as lead poisoning in which the pressure is raised, the sphygmometer is of course of much service.

3. DECRESCENT ATHEROSCLEROSIS.

Although, in this change, hyperpiesis is not a characteristic factor, we must beware of its intervention. It is unnecessary to insist upon the peril of any considerable rise of arterial pressure in subjects whose vessels under ordinary pressures are already decaying. Of the causes of decrescent atherosclerosis we are in ignorance. Of its incidence, and various dietetic and climatic conditions, we have no trustworthy records, and consequently no inferences as to regimen. It may be that, in Sir W. Osler's words, bad tubing was used in the making up ; it is probably, like hyperpiesis, hereditary. It has nothing to do with gluttony ; so far from originating in overfeeding, decrescent atherosclerosis is prone to occur in hardworked and underfed or ill-fed persons. It is very common in workhouses, and is very prevalent, at least in the arteries of the limbs, among labourers who have not the means of excess, and have been exposed to changes of weather and effort. Some cases may be ultimate stages of poisons, extrinsic or intrinsic. I find no evidence that care and anxiety, which may produce hyperpiesis, give rise to involutionary arterial disease ; it appears alike in the poor and in persons of easy and happy circumstances. As life advances, pressures slowly rise, even by some 20 mm. Hg ; and if they become relatively excessive the tunica media is strained. In decrescent atherosclerosis we must prevent or remove attacks of hyperpiesis, from which these patients are no more immune than other people ; and in involutionary cases intercurrent plethora may be dissipated as it is in the first stage of hyperpiesia. In practice we can nearly always diagnose the case as of one or the other kind. Bright's disease is not essentially, nor even frequently, associated with it, diminished as the kidneys, as most other parts and organs, may be by atrophic involution.

Grotesquely distorted and extensively calcified as these decrescent arteries become, treatment, seeing that the causes are unknown, is as yet very far from systematic. Iodide of potassium, even if useful in hyperpietic cases, can be of little service in the senile. The consequences are not those of the hyperpietic form. Such patients do not die of apoplexy, not, that is, in its hæmorrhagic mode. In the involutionary disease the arteries become less and less pervious, and the peripheral parts, as they lose irrigation, fail more and more ; but these events deprive the sufferer rather of the values of life than of life itself. Like the rest of the organs, the heart is more disposed to deteriorative than to hypertrophic alterations, and so is less apt to burst the vessels. Thus, decrescent atherosclerotics often survive to great and even to extreme old age. On the other hand, the disease may appear and advance rapidly in comparatively young persons, even in the fourth decade of life. Treatment, then, in these cases, has to concern itself rather with nutrition and economy than with depletion. By adapting the diet to a diminishing output of bodily work, by providing for the best assimilation of the simpler foods, by the addition from time to time of ferruginous and other tonics, by gentle exercises in fresh air, by mild winter climate, and by the relaxation of work and care, but by encouragement of a proper activity of both mind and body, and dissuasion from elderly indolence, the tendency to this degeneration is to be counteracted ; that is, by a restorative strategy as patient as the morbid proclivities themselves. Fibrolysins and decalcifying agents have been suggested, but in so far as they act as such they would act injuriously in dissolving the protective framework of the vessels. Of antisclerotic serums and salts I know little, and expect nothing. To exclude calcium from the food seems futile, and probably is so ; this secondary deposit is harmless, and may be a stopgap.

To sum up : Involutionary atherosclerosis is incurable. The toxic forms of atherosclerosis seem to undergo some mitigation in time ; syphilis apart, we have few specific means of cure. The use of vaccines may come hereafter ; meanwhile we must promote the excretions and prevent the engendering of toxins. As life goes on, these cases may merge into the involutionary form. It is in the hyperpietic form that treatment is most efficacious. If this malady be discovered before it has impressed itself indelibly on the vessels, we may wholly drive it away, or by no very irksome watchfulness dispel it again

and again : even if we do not detect it till a later stage, we may still control it for good, or at worst postpone or possibly avert its extremer perils.

ACUTE AND CHRONIC THORACIC AORTITIS.

Of the treatment of chronic aortitis, or again of atheroma, there is not much to say beyond that of the general diseases of which it is a part. In fact, unless it be in syphilis, it is rarely directly cognizable until it has attained such dimensions as to be more or less irremediable. Indeed, too often in syphilis when a chronic aortitis reveals itself to the clinical observer, it has issued in aneurysm or large anfractuous (Hodgson-Welch) dilatation. In this stage, as the spirochæte is present in the adventitia, specific remedies may have still a considerable efficiency. Subacute aortitis, as such or as a phase of more chronic changes, is more frequent than is generally supposed ; if the attention be awake to the crucial symptoms, the diagnosis is not difficult. Its acuter forms are most frequent in syphilis, influenza, and rheumatic fever ; they must be anxiously watched for and treated by absolute rest. In syphilis, especially, the state of the arterial system and of the aorta should be watched, and specific treatment actively resumed on the appearance of any suspicious sign or symptom. If acute or exacerbated, aortitis may be attended by angina pectoris ; in the chronic degree a slighter ' stenocardia ' may present itself. Pain about the middle or upper sternum, especially if passing down the arms, aggravated by exertion, meals, emotion, and whatsoever excites the circulation, should be promptly recognized. If not averted the disease is prone to invade the aortic valve also.

The first condition is rest, for a time as absolute as possible. As perpetual bed, for weeks and weeks, depresses both animal and mental spirits, it is a great advantage to order the rest, after sanatorium methods, in the open air. Gentle massage should be tried before the patient is released from his couch. Thus the appetite and general metabolism are encouraged. Besides the vigilant use of alteratives, gentle laxatives, and other means of securing continuous clean running of the circulation, vasodilator drugs must be used, not infrequently, so long as effort is attended with substernal discomfort. Erythroltetranitrate or nitrite of sodium may be used in appropriate doses. Exacerbations of the pain are often attended by some rise of temperature for a day or two, especially in cases of rheumatic fever, indicating the inflammation at work within ; but beyond the rest, this slight aortic fever may not need special treatment. All cares of life and business must be resolutely excluded. Digitalis and other drugs reinforcing or accelerating the circulation must be avoided. Meals must be light and unstimulating, and, if frequent, very moderate in quantity. Iodide of potassium is to be administered throughout the illness ; but unless there be evidence of syphilis, 5 gr. three times a day is sufficient. In rheumatic cases, of course, the salicylates also will be needed. In men of middle life syphilis is the most frequent cause, and must be detected, and by the usual specific means combated, as promptly as possible. *T. Clifford Allbutt.*

ATMOSPHERIC TREATMENT.—The application of this treatment rests on the basis of sun-, light-, and air-baths, and includes every possible means of allowing the body surface to come into contact with the atmosphere with the object of hardening up the patient. The habit of taking deep breaths every time we go into the open air is an excellent one ; similarly, gymnastic exercises may be carried out in almost a nude condition before a bedroom window, and daily exercises and outdoor pastimes and games practised. Skipping in the open air with only a running suit on is excellent.

As regards the sun, it is of the utmost importance, in dealing with the healthy as well as the sick, not to shut out sun from rooms by blinds or curtains more than is absolutely necessary. Sun and light have a highly important psychic effect. An Italian proverb has it that when the sun is absent the physician is present !

During the night the air is at least available, and the late Dr. McCormac, of Belfast, was one of the very first to emphasize the extreme value of open windows during sleep, long before open-air sanatoria were thought of. Wind and rain have to be considered, but that is a mere matter of window arrangements and screens, and, as Rikli says, " the worst outside air is better than the best inside air ". Some subjects do not flourish with open windows and very low temperatures, but they are the exception rather than the rule, and it is a matter of training and hardening very largely. Care must be taken to

avoid sleeping on a bed between an open window and an imperfectly closed door or fireplace. Chills are rare, and with improved health the craving for fresh air becomes a habit, so that positive discomfort is experienced in hot or stuffy rooms. There is greatly improved oxidation, more active metabolism, and stimulated vital energy.

Aerotherapy, along with hydropathy, now forms the groundwork of the system of treatment employed in many of the large sanatoria on the continent for chronic nervous and other diseases.

The Simple Air Bath is usually taken in a bedroom or dressing-room. A cool air-douche is felt, the first result of which is an irresistible desire on the patient's part to move about and, perhaps, rub his limbs. When the patient is weak and the bare hand is insufficient, a horsehair glove or one of Turkey-towelling material may be used to rub the skin surface. Thus the feeling of cold and 'goose-flesh' induced by stripping rapidly disappears. A reactionary glow is as usual and necessary as after a water-bath, and if not obtained the patient should be warmly covered up until it is secured.

The duration of the bath depends on the temperature of the air and that of the patient, as well as his constitution. It may last from three minutes to a quarter of an hour or longer, but every effort must be used to avoid a chill and to ensure reaction on the part of debilitated patients. The hour of bathing varies. To some it is most beneficial before retiring for the night, but occasionally this induces insomnia. With most the best time is the early morning on rising.

The right temperature may vary from 60° to 85°, but the most agreeable is 64° to 68°. In such a temperature, once the habit has been acquired, the bath may be prolonged for hours. Above 85° the heat becomes too great for a long bath and is enervating. At lower temperatures, such as 60°, more exercise is needed, and still more with brief baths at 45° to 47°.

The bath is a methodical chilling process to which the patient is gradually trained. *Ceteris paribus*, these baths are followed by the most agreeable and exhilarating feeling.

T. D. Luke.

BACTERIOTHERAPEUTICS.—(*See* Specific Therapy.)

BALANITIS.—By balanitis is meant, strictly speaking, inflammation of the glans penis, while posthitis denotes an inflammation of the prepuce, but as the one never occurs without the other, balanitis is often used as an abbreviation of balano-posthitis. The causes may be divided into venereal and non-venereal. Of the former no further mention need be made here, except to note the difficulty and the importance of making a correct diagnosis. Bacteriological investigation may be necessary in a doubtful case. Of the non-venereal variety there are two main causes, viz., phimosis, or long prepuce, and want of cleanliness. If the prepuce cannot be retracted, the parts cannot be adequately cleansed, and balanitis is almost certain to supervene sooner or later. Impure intercourse, gout and diabetes, cystitis and decomposition of the urine may be causative factors in individual cases.

Treatment.—This varies with the cause. Of cases due to venereal disease the treatment is given elsewhere. In the non-venereal cases the first thing to decide is whether the prepuce can be retracted fully or not, without the fear of paraphimosis supervening. If it cannot, it must be slit up, or circumcision must be performed. In very acute cases —and these are usually gonorrhœal—and when the swelling of the prepuce is considerable, the latter should be slit up to the coronal sulcus. In subacute, chronic, and recurrent cases, circumcision is to be preferred. In gouty and diabetic patients circumcision should rarely be resorted to, and then only with the precautions mentioned under Phimosis.

In all cases frequent cleansing with boracic lotion, and the application of a strip of gauze or lint wrung out of lead lotion to separate the adjacent inflamed surfaces of the glans and prepuce, when the latter has not been removed, will effect a cure. In chronic cases in adults the urine should always be examined. In gouty and diabetic cases appropriate dietetic and medicinal treatment is called for. In the diabetic form Thomson Walker recommends the use of powders—boric acid, starch, and zinc oxide—and the application of zinc oxide ointment to the skin of penis and scrotum, which is often affected by eczema.

H. A. T. Fairbank.

BALDNESS.—(*See* Alopecia Areata; Hair, Diseases of.)

BANTI'S DISEASE.—(*See* Splenic Anæmia.)

BATHS.—(*See* Hydrotherapy.)

BELL'S PALSY.—(*See* Facial Paralysis.)

BERI-BERI.—The main dangers arise from cardiac dilatation or paroxysms (cardiac crises) resulting from the paralysis of the vagus.

Treatment.—Complete rest in the recumbent position. Nutritious food in small quantities at a time, and similar restriction in the amount of fluid given at a time, in order to avoid embarrassment of the cardiac action from dilatation of the stomach. Rice and other bulky forms of food must not be given on account of this liability, with the addition in the case of rice that in some kinds of rice a deficiency of some substance, 'vitamine', contained in the outer portion of the grain, seems to be the cause of the neuritis. Beans, yeast, and substances prepared from the millings of rice are probably of some benefit in remedying this deficiency. Adrenalin is claimed to be of advantage by some. In cardiac paroxysms, amyl nitrite, capsules of 5 min., or nitroglycerin tabloids, $\frac{1}{100}$ gr., should be used, and in extreme cases venesection may be advisable. Strychnine at this stage, hypodermically or otherwise, may be required.

The bowels must be kept freely open with saline aperients. Sodium sulphate, 1 drachm every morning, will usually suffice. Removal of the persons from the locality in which the disease was acquired is by many considered an essential.

When the more acute symptoms have subsided and the danger of sudden cardiac dilatation is over, graduated exercise may be allowed. In cases where paralysis is complete, care must be taken to avoid contraction of joints. When the 'foot-drop' is extreme, a cradle should be used to prevent the weight of the bedclothes increasing the deformity. If it is already established, splints may be necessary. Strychnine should be avoided in the early stages, and faradization and massage employed only when all acute symptoms, including muscular tenderness, have subsided. Massage is useful in the convalescent stages in regaining the muscular tone. As a test of the complete restoration of the nervous and muscular mechanism the squatting test is useful; the adductor muscles of the legs being generally the most severely affected. *C. W. Daniels.*

BERNHARDT'S DISEASE.—(*See* Nerves, Peripheral.)

BIER'S HYPERÆMIC TREATMENT.—Artificially-produced hyperæmia as a method of treatment was introduced by Professor Bier in 1892. Its object is to cause a hyperæmic condition of the diseased area, or to increase an already existing hyperæmia in an inflamed part, and thereby to aid the living tissues in their struggle against microbic invasion, in the belief that a sensible increase in the volume of the blood *circulating* through an inflamed part is, owing to the antimicrobic action of the blood, a real help to the tissues in their contest with the invading micro-organisms.

It is of the first importance that the blood continue to circulate. Any stasis of the blood-current would inevitably be productive of harm, as it would diminish the resisting power of the tissues in a chronic inflammatory condition, and, in an acute inflammation, would tend to cause gangrene. Too great emphasis cannot be placed upon the fact that *the blood must, throughout the whole course of treatment, continue to circulate, and that stasis must be avoided, as it can cause only harm and may spell disaster.* Therefore the duty of the surgeon is to assure himself that the blood in the part subject to treatment is circulating freely. Where the rubber bandage is employed, this is done by noting the beat of the pulse in an artery distal to the constriction. Frequently, however, owing to œdema the pulse can, after some time, barely be felt. In all cases it will be found a safe rule to regard the application of the method as satisfactory when the treatment is painless, or when, after a few minutes, any existing pain is mitigated. Should the reverse be the case, it may be taken that the constricting band or the cupping-glass is too firmly applied, and the mistake must at once be rectified.

The two essentials therefore are: (1) That the blood continue to circulate in the inflamed part, and (2) That the treatment be painless. Emphasis is to be placed on the fact that the method, properly applied, is entirely free from pain, and that, if pain be present prior to its employment, this symptom should be mitigated within a few minutes. The application should be painless and the patient should look forward with satisfaction to its renewal.

Of the five cardinal signs of inflammation—heat, redness, swelling, pain, and impaired function—the hyperæmic treatment increases the first three and diminishes the last two. Its aims may be stated to be: (1) Arrest, or at least mitigation, of the infective process; (2) Prevention of suppuration in many cases in which this is threatened; (3) Relief or diminution of pain; (4) Avoidance of operative treatment in many cases, or, where this is not possible, the substitution of a less severe and less mutilating operation than would otherwise be necessary; (5) Saving of time owing to hastening the eliminating processes in cases in which suppuration and necrosis are unavoidable, as in carbuncles in their later stages; (6) Increase in the antimicrobic action of the blood owing chiefly to the greater quantity circulating in the diseased area; (7) Stimulation of the process of repair, as shown by the success attending its use in cases of delayed union of fractures.

METHODS OF APPLICATION.

To attain these objects three means are employed: (1) *Elastic constriction*; (2) *Suction by means of cupping-glasses*; (3) *Heated air.*

The first of these causes a hyperæmia which is purely passive, i.e., venous; the second, one which is chiefly passive, though at first, in part, active or arterial; the third, on the other hand, induces an active, i.e., arterial, hyperæmia.

A priori it would be imagined that the maximum of benefit would follow the employment of arterial hyperæmia, but in practice it will be found that, as a rule, passive hyperæmia is relied on far more than the active (arterial) form, and certainly yields results that are, on the whole, more satisfactory.

In the following remarks, passive hyperæmia induced by elastic constriction will receive chief attention, owing to the facts that it is the simplest method to use and that most commonly employed, as it needs no apparatus except a rubber bandage.

Suction requires cupping-glasses of various sizes and suction balls of different force. It is necessary to have available *at least* three different sizes. The method is applicable chiefly to the trunk, i.e., where elastic constriction cannot be employed.

The heated-air method is the least frequently used, as it requires a special form of apparatus which has to be made to suit each individual case, and it calls for more watchful care and attention; for these reasons it is less employed by the practitioner.

1. **Elastic Constriction** is the oldest of Bier's methods. The best results will be obtained by using a short Martin's bandage, 1½ to 2 in. in breadth for the upper limb, and 2 to 2½ in. for the lower—applied to the upper arm in affections of or below the elbow, and to the lower part of the thigh where the lesion to be treated is in the knee or in a part distal to it. In affections of the head and neck, as also in scrotal, penile, and testicular maladies, a band of ordinary garter elastic answers admirably. In all these cases the constriction is applied to what may be termed the root of the part; in all cases, of course, proximal to the seat of the affection. Unfortunately, the above comprise the only regions that are amenable to the elastic-bandage constriction. The writer has been unable to apply the principle to the hip-joint, and has been only partially successful with the shoulder-joint, where he employs the bandage over the middle of the clavicle and upon a firm pad placed in the axilla.

It is of prime importance in the employment of the bandage that *the pulse be felt distal to the bandage.* The part undergoing treatment must be of a dark, congested, bluish colour, which has in it a suggestion of red.

It is impossible to lay down definite rules as to the length of time the bandage should be applied per diem. Each case is a law unto itself. In general the aim in chronic cases should be nine hours 'on' and three hours 'off'. In young children three hours on and three hours off may be the rule, until the part becomes accustomed to the change in its circulation. After the removal of the constricting bandage, the congested part is elevated, and the area covered by the bandage should be sponged with

80 per cent alcohol. With regard to cases of acute inflammation, experience teaches that many such will not stand so long-continued an application of the bandage, and the same applies, at the commencement of the treatment, to many chronic cases. The sensations of the patient must always be the guide, and in any case it is better at first to *underdo* rather than *overdo* the treatment. In applying the bandage it is well to make each turn cover the upper two-thirds of the turn below, in order to diffuse the constriction evenly over a large area. In affections of the hand and foot, the bandage should be applied above the elbow and knee respectively, as in the forearm and leg the interosseous veins can easily escape constriction, and thus interfere with production of the desired hyperæmia.

Should the inflammatory lesion have reached the stage of suppuration prior to the commencement of the treatment by elastic constriction, then, as in every case, it is essential that the pus should first be evacuated. Let it be clearly understood that Bier's treatment, potent as it undoubtedly is in cases in which suppuration is threatened, is powerless to effect the absorption of pus already present. The abscess, acute or chronic, must be incised, and the pus evacuated. This is, of course, of more immediate importance in acute than in chronic suppuration. Even in acute cases, however, only an incision large enough to allow the escape of the pus is required. Large incisions are not called for, and the harmful and too frequent practice of squeezing the abscess cavity, which is apt to cause laceration of the protecting zone surrounding the area of suppuration, with resulting pyogenic infection of a diffuse nature, is strongly to be deprecated. Once an abscess has been opened, even by a tiny puncture, the discharge, when Bier's bandage is employed, is usually free, and the mitigation of symptoms due to septic absorption is quickly and pleasantly attained.

The writer has employed Bier's elastic bandage most frequently in cases of *tuberculous disease* of the elbow, wrist, bones and joints of hand and foot, knee, and ankle. In such cases results have been obtained far surpassing those he has observed with any other method of treatment. It must be admitted that in almost every case of tuberculous disease of the above joints, injection into the joint cavity of a sterilized 10 per cent emulsion of iodoform in glycerin has been employed at the same time as elastic constriction. It is a matter of difficulty, therefore, to assign the proportion of credit due to each measure. Each is of real value, and in combination they certainly offer the best chance of cure open to us in early tuberculous disease of these joints.

Among other conditions in which the constricting bandage has been usefully employed may be mentioned: *whitlows* of all types, with or without incision to evacuate pus; *suppurative arthritis* of elbow, wrist, knee, and ankle, after incision; *chilblains*; *septic injuries* of all descriptions to upper and lower limbs accompanied by *lymphangitis and cellulitis*; *osteomyelitis* of the bones of the upper and lower extremities of pyogenic and tuberculous origin; *tenosynovitis* of pyogenic, tuberculous, or gonorrhœal origin: and *gonorrhœal arthritis*, especially of the knee in the male, and of the wrist-joint in the female. The above list makes no pretension to be exhaustive. It merely comprises the indications most frequently met with in the practice of the writer. With increasing experience of the method, the practitioner will probably come to the conclusion that it is of benefit in the larger number of affections of the extremities which come under his care.

In the treatment of septic conditions of the head and neck, the employment of a collar of garter elastic round the lowest part of the neck has yielded excellent results. Many cases of infected scalp wounds, of erysipelas of the head and face, and of boils and carbuncles, have thus been benefited. In tuberculous adenitis of the neck, and in lupus of the face, the results have generally been comparatively disappointing.

In gonorrhœal and tuberculous epididymitis good results have been obtained.

In cases of acute inflammation, the cutaneous redness frequently extends several inches higher up the limb than was the case prior to the application of the bandage, and may extend even to the area of constriction. This condition, alarming as it may appear to the novice, as apparently indicating extension of the inflammation and therefore failure of the treatment, or even worse, need occasion no alarm, and may be regarded as almost normal. In chronic inflammatory conditions such increase in the area of redness is hardly ever seen. In suppurative conditions, which, as above stated, always demand incision, the purulent discharge generally is increased at first but rapidly diminishes, as do also the redness and œdema.

For the first few hours after its application, the constricting bandage demands constant supervision, and in acute cases it is wise to insist upon the attendance of a reliable nurse.

At the risk of repetition the writer would emphasize that success depends upon the correct application of the bandage. Too tight constriction may endanger the vitality of the affected part, especially in acute inflammatory conditions of the fingers, e.g., whitlow. Venous congestion without arterial obstruction is to be attained. Most important of all: no pain should be caused by the application of the constriction. The patient's sensations must be the practitioner's guide, and when a patient of ordinary intelligence makes no complaint, it may be assumed that there is nothing amiss with the method of application.

2. **Suction by means of Cupping-glasses** (partial vacuum).—Of this method the writer has had considerable experience, though not so much as with the constricting bandage. It is employed chiefly for affections situated upon the trunk, where the constricting bandage is inapplicable. The virtues of the method are many, and its range of application is extensive; but the writer has to admit that the results have impressed him less than those obtained in the extremities by the use of elastic constriction.

In general it will be found that the more superficial the affection, the better will it react to the suction method. The treatment cannot be employed continuously.

Bier's warning is: *Do not overdo the suction; never cause pain.* The skin must assume a bluish-red colour. If the skin appears white (anæmia), the suction is too forcible.

As in the case of the constricting bandage, when pus is present, a small incision—commonly a mere puncture will suffice—must be made prior to the application of the suction glass. The writer generally employs the latter for half an hour twice daily. It is employed for five minutes, then removed for five minutes in order to permit the œdema and hyperæmia to subside; it is re-applied for five minutes, and again removed for five minutes, and this process is repeated for one hour, during which time the glass will have been 'on' for half an hour and 'off' for the same period. It must be admitted that the tendency is to apply too strong suction, especially in cases of acute inflammation. Here, again, the patient's sensations must be the guide. If real pain be caused, or already existing pain be markedly aggravated, the suction must be deemed excessive. The writer has observed that in some instances even gentle suction causes pain. In such he has found that a puncture into the affected part often gave vent to unsuspected pus, and enabled the suction to be applied to the entire satisfaction of the patient. Suction applied after an incision naturally causes at first a rather free escape of blood. This, however, soon ceases. Various forms of large vacuum glasses with suction pumps attached, and provided with a rubber cuff to grip firmly the segment of the limb just outside the glass jar, have been devised by Bier and his assistant Klapp. Into such chambers the arm or the leg can be placed. The writer has had but small experience of these forms of apparatus. They are necessarily costly, and different forms and sizes are required for different parts, e.g., elbow and ankle. Moreover they present, in the opinion of the writer, no real advantage over the simple elastic constricting bandage.

In all suppurative conditions in which an incision or puncture has been made, the writer has satisfied himself that, by means of the suction-glass treatment, the pathological condition has been ameliorated; the removal of sloughs, when present, has been painlessly expedited; and a healing of the lesion more rapid than is normally the case has been obtained. The method has been employed chiefly in: (1) Cases of *mastitis*, with or without incision, according to the presence or absence of suppuration; (2) *Carbuncles* and *furuncles* after incision, and in *blind boils* without puncture; (3) *Acute abscesses*, after a small puncture had been made to allow of the escape of pus; (4) The treatment of *chronic abscesses* in which the closure of a persistent sinus was the object primarily aimed at. In all such cases the treatment has yielded better results than any previously seen by the writer.

It has also been employed, though with far less convincing results, in cases of *lupus*, especially of the face; in post-operative *keloid cicatrices*; and in *otitis media suppurativa*, after incision or rupture of the membrana tympani, i.e., in both acute and chronic forms. In the majority of the above cases the suction treatment apparently proved of distinct benefit, and in no instance did it exercise any harmful influence.

3. **Heated Air.**—This method differs from the two already described in that the

hyperæmia produced is arterial and not venous. Theoretically, therefore, it might be expected to produce the best results. In the writer's experience, however, it is the least valuable of the three. The hot-air chamber has been found costly, and difficult to manage, requiring unremitting supervision on the part of the medical attendant (in two cases the patients received nasty burns), whilst the results were somewhat inferior to those obtained by the other methods. It is chiefly employed in chronic cases which are the result of previous acute inflammations, where it is of value in hastening the absorption and the removal of chronic exudations and adhesions, and is also largely made use of in the treatment of neuralgic affections.

Heated air is employed by means of (*a*) *The heated-air chamber*, and (*b*) *The heated-air douche*, and it is of primary importance that the air be *dry*.

a. The heated-air chamber, in its simplest form, is a wooden box provided with openings, one of which has attached to it some form of cuff to embrace the limb at the junction of the segments outside and inside the box. Felt forms a useful material for the cuff, and this is provided with a string, by the tightening of which the cuff may be firmly applied to the limb. Other openings in the box serve to provide for the entrance and the exit of the heated air. Through a small opening a thermometer is inserted, which should have its bulb in the hot-air chamber and its marked stem outside, where it can easily be seen. The source of heat is a spirit, oil, or gas lamp, or better, an electric heater. Except in the case of the last mentioned, the lamp is outside the box, and the opening into the latter is provided with an inverted metal funnel, the wide end of which is placed above the chimney of the lamp whilst the narrow end enters the hot-air chamber. Instead of purchasing expensive apparatus, a rough but serviceable heated-air chamber may be made by even an amateur carpenter. Special care must be taken in such a case to use dry wood, as otherwise resin may sweat out of the wood and burn the patient. At the commencement it is well to use a thermometer. Soon, however, the patient will learn to estimate the temperature desirable. Here, as always in Bier's treatment, the patient's sensations constitute the best index. Not only must there be no pain, but the affected parts must never feel uncomfortably hot.

In general, the writer raises the temperature in the chamber from 180° to 230°, or even to 250° F. Higher temperatures have been employed, but, for divers reasons, are inadvisable. Accidents against which the practitioner should be warned have happened. Burns, apart from those caused by resin drops, and even gangrene of the toes and fingers, have occurred. The writer has seen one case in which gangrene of three toes, necessitating amputation, resulted. It is also to be borne in mind that intense heat, e.g., 250° F., markedly diminishes the sensibility, especially in the peripheral parts, e.g., fingers and toes, and thus burns may not be recognized until after removal of the affected part from the heated air-chamber. In general, the writer has employed this method for half an hour daily. As it is inadvisable suddenly to reduce the temperature of the affected part from say 230°–250° F. to the temperature of the room, he advises that after half an hour's exposure to the heated air the lamp be extinguished and the freely sweating member be allowed to cool slowly for half an hour before its removal from the chamber.

b. The hot-air douche has been employed by the writer on comparatively few occasions. He is therefore unable to write concerning it from extensive personal observation. In a few cases in which he has employed the method he has made use of a large, inverted metal funnel placed under a large spirit or oil lamp. To the upper, narrower end of the funnel a metal tube (copper) has been attached by means of a universal joint. This tube, which is about one yard in length, terminates in a rose like that of a watering-pot, but with much larger perforations. In cases in which it is advisable to concentrate the heated air on a very small area, the rose is not employed. In all cases it is necessary to encase in asbestos the end of the tube which is held in the hand, or to use a glove which has been rendered a non-conductor of heat. It is a difficult matter to estimate the degree of heat. Obviously the nearer the part to the end of the tube, the higher the temperature, and *vice versa*. In general, the heat should be raised gradually by approximating the affected part to the end of the tube, and the maximum temperature that can be comfortably borne should be employed. The writer prefers to apply the heated-air douche for two periods of a quarter of an hour each, and in neuralgic affections he chooses the time at which the neuralgic pain usually commences. In sciatica, marked relief has

been obtained in some cases; in more, the results have been disappointing. The best results have been in cases of neuralgia involving the nerves of the head, especially the trigeminal and great occipital nerves, and in cases of chronic osteitis, pyogenic or syphilitic in origin, involving chiefly the mastoid process and the upper ends of the tibia.

Two patients suffering, the one from chronic pyogenic mastoiditis secondary to middle-ear disease, and the other from chronic osteitis of the upper end of the tibia—the result of pyogenic osteomyelitis in childhood—have employed the heated-air douche for more than three years, with entire satisfaction. In both the above cases operative treatment had secured only temporary relief from the characteristic boring pains in the bone.

The writer desires to draw attention to the fact that he has by no means slavishly followed Professor Bier's directions in every detail. This article is to be considered as embodying the experience of a British surgeon who has studied Bier's methods and has not hesitated to modify them as the result of his own experience. It is believed, however, that it deviates from his instructions in no matter of prime importance.

Herbert F. Waterhouse.

BILE-DUCTS, CATARRH OF.—The commonest affection of the ducts—catarrh of the mucous membrane—may be simple or suppurative. Simple catarrh may be acute or chronic.

Acute Catarrh (catarrhal cholangitis) is often spoken of as catarrhal jaundice. Unless very severe it is not necessary for the patient to remain in bed. The diet should be liquid at first, and gradually increased, but should remain light till complete recovery; if there be great irritability of the stomach, hot water alone should be given till it subsides. Severe pain may be treated by hot fomentations, with or without belladonna. One grain of calomel should be given at the onset; if not an actual cholagogue, it at any rate increases the bile excreted from the biliary passages.

After the first onset the bowels should be kept acting regularly by administration of Vichy water or phosphate or sulphate of soda.

Attention should be directed to the cause of the catarrh. If due to syphilis, small doses of hydrargyrum c. creta may be given. Treatment by salvarsan or other arsenical preparations must, if resorted to, be conducted with great caution; for such compounds are apt, in persons already suffering from hepatic disorders, to aggravate the condition, or even to give rise to acute atrophy of the liver; these substances occasionally set up jaundice in persons not already suffering from it. In many cases not due to syphilis, too, small repeated doses of grey powder are useful, possibly from the action of the drug on the pancreas. The gastroduodenal catarrh present in most, if not all, cases must be treated by alkalis and bismuth, and may be benefited by giving antiseptics internally, such as carbolic acid, salol, or β-naphthol. The jaundice is often lessened by salicylates, which probably increase the secretion and render the bile more liquid; chloride of ammonium may be given with the same object, and also bile salts.

'Krull's irrigations' are recommended—that is, a daily quick irrigation into the colon of one quart of water at 59° to 68° F., or even ice cold. The irrigation produces violent intestinal peristalsis, and with it contractions of the musculature of the biliary passages which favour the flow of bile into the intestine; possibly also the functioning of the liver is helped by quickening of the portal circulation.

Abdominal massage, and breathing and other exercises, are recommended as assisting the passage of bile through the biliary passages.

The itching of the skin in jaundice is difficult to relieve: ointments of bromocoll and other medicaments are recommended, but are impracticable, and tepid baths with dissolved bicarbonate of soda give most relief.

When improvement is setting in, it may be hastened by mineral acids and bitter infusions.

Chronic Catarrhal Cholangitis may follow on an acute attack or come on gradually from the first. It is often set up by gall-stones in the biliary passages, the jaundice in such cases being due to catarrh of the ducts rather than to the actual gall-stones; the chronic catarrh may persist after the gall-stones have been got rid of. It is often also an accompaniment of hepatitis. For treatment of catarrh arising from gall-stones, *see* GALL-STONES.

Chronic catarrh, apart from gall-stones, may be very persistent, the jaundice and emaciation resulting from it giving the case much resemblance to that of hepatitis or cancer, or, still more, to disease of the head of the pancreas.

It should be treated by great care in diet, fatty, rich, or indigestible foods being avoided. Small doses of mercurials, iridin, or euonymin should be given at night, and alkalis and salicylates in the day. Constipation must be overcome, and walking exercise taken regularly—with most advantage before breakfast. Such patients benefit by a course of Carlsbad waters, or, if unable to go abroad, by the Harrogate or Strathpeffer waters.

Although both acute and chronic catarrh of the biliary ducts occur apart from actual disease of the liver, they may also be associated with such of its affections as cancer and the various forms of hepatitis or cirrhosis—indeed, the biliary cirrhosis of Hanot has been said to commence in an inflammatory condition of the intrahepatic branches of the bile-ducts ; in such cases, although the liver disease itself may be incurable, judicious treatment may succeed in freeing the patient from the jaundice resulting from the catarrh. The drinking of hot water and administration of salicylates and alkalis, together with small doses of mercurials, should be ordered.

Suppurative Cholangitis arises from organisms entering the ducts, either through the blood-stream in the liver, or from the alimentary canal by the biliary passages ; even if suppuration first occur in the larger ducts, it will soon spread into the finer duct branches within the liver.

The treatment consists in free drainage of the biliary passages by operation.

Infective Cholangitis is a variety spoken of by some as special to the presence of gall-stones in the common duct, but more generally agreed to be producible by any cause which will allow infective organisms to enter the ducts. The importance of the typhoid bacillus as an infective organism causative of cholecystitis has become more marked ; it has been suggested that this organism gets into the biliary passages from the spleen. The condition is characterized by paroxysmal attacks of pyrexia, and has been called 'intermittent hepatic fever'. With these occur attacks of colic resembling those produced by a calculus, shivers, and temporary jaundice. These attacks appear due to an obstruction in the common duct, which as a rule allows the passage of bile, but from time to time becomes complete. These attacks may continue for years, on and off, and may terminate in recovery ; but they may, per contra, lead to fatal toxæmia or exhaustion, and the treatment should, therefore, be operative removal of the obstruction when this is possible. *Sidney Phillips.*

BILHARZIA (Schistosoma hæmatobium).—Specific treatment consists in frequent intravenous injections of progressively increasing doses of tartar emetic ; the initial dose should be $\frac{1}{2}$ gr. dissolved in 5 c.c. of sterile saline. Succeeding doses should be augmented by $\frac{1}{2}$ gr., till the maximum individual dose of 2 gr. is reached. A total of 20 gr. in all, spread over a period of three weeks, is necessary before all the adult worms have been killed. The ova passed in the urine are seen to be degenerated, and soon cease to be passed altogether.

The symptoms due to the passage of the eggs through the mucosa may be alleviated by local measures. Rest is essential in severe cases, and over-exertion in all cases must be avoided. If the mucous membrane of the rectum be implicated, straining must be avoided, and the regular use of aperients is indicated.

The possibility of the formation of calculus must always be remembered, and cirrhotic changes in the kidneys may be a late result.

Schistosoma japonicum causes cirrhotic changes in the liver, the mesenteric glands, and the walls of the intestine. These may lead to dysenteric symptoms, simple diarrhœa, or ascites. Specific treatment with antimony tartrate on the lines so successful in *S. hæmatobium* infections should be employed. In the early stages, the urticaria which is common requires nothing but palliative treatment. *C. W. Daniels.*

BILIARY FISTULA.—This is due to obstruction of the cystic or common duct, or to faulty technique in establishing drainage of the gall-bladder by cholecystostomy. If the cystic duct is obstructed, a mucoid discharge escapes ; if the common duct is obstructed, bile in large quantities discharges.

The treatment of the fistula depends on its cause : if a stone is impacted in the cystic duct, it may be possible to extract it with suitable forceps through the fistula ; failing this the abdomen should be opened, and the stone removed either through the gall-bladder or by incision of the cystic duct.

Many cases are due to impaction of a stone in the common duct ; occasionally the stone may be induced to pass on into the duodenum by the injection of warm olive oil and by plugging the fistulous opening ; if this fails, the abdomen must be opened, and choledochotomy or cholecystenterostomy performed ; the former operation is, of course, preferable.

A persistent fistula, in the absence of an impacted stone, should be treated in the first instance by freeing the gall-bladder from the surrounding structures to which it is adherent, and establishing drainage by means of a rubber tube sewn into the gall-bladder. In these cases the fistula is commonly due to kinking of the ducts from malposition of the gall-bladder, or to stenosis of the ducts from inflammatory adhesions ; hence cholecystectomy is to be avoided unless the patency of the common duct has been clearly established. If palliative measures and the establishment of free drainage fail, cholecystenterostomy may be performed ; but from the nature of the cases this is often extremely difficult.

Fistulæ due to obstruction of the common duct by malignant growth are best left alone ; cholecystenterostomy as a palliative proceeding in cases of malignant disease is an operation involving decided risk, and if successful adds little to the patient's comfort.

Crisp English.

BILIOUS ATTACKS.—(*See* GASTRITIS ; MIGRAINE ; VOMITING IN CHILDHOOD ; VOMITING (CYCLICAL), etc.)

BIRTH PALSY.—The usual lesion is Erb-Duchenne paralysis due to overstretching of the fifth cervical nerve ; other divisions may be involved in severe cases, even to the whole plexus. It occurs with about equal frequency in head and breech presentations. Occasionally the paralysis is of the lower-arm type ; this occurs usually after breech

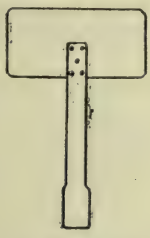


Fig. 3. — Special splint for birth paralysis and some cases of infantile paralysis of the upper limb.



Fig. 4.—Special splint applied to a case of birth paralysis.

presentations with the arms extended, occasionally after face presentations. It is not common to find the lesion diagnosed at birth. Often the child comes under observation owing to tenderness in the clavicular region ; in other cases it is noticed that the extremity is immobile.

In the usual type due to injury of the fifth anterior primary division, the arm is held close to the side, and the forearm is pronated and extended. When the first dorsal root is implicated, the intrinsic muscles of the hand are paralyzed. But this is usually associated with injury to the eighth cervical, affecting the flexors of the fingers.

TREATMENT.—If seen early, the arm must be bandaged to the side with the paralyzed muscles relaxed and kept absolutely at rest ; as soon as all tenderness has disappeared, massage and movements must be employed. Special care must be taken to avoid deformity due to contractures in the opposing muscles. In the Erb-Duchenne type, the splint devised by Fairbank should be employed. (*See Figs.* 3 and 4.) Under this treatment incomplete injuries are likely to improve, and the prognosis is favourable. Sixty per cent of the cases under my care have recovered completely without operative interference. If at the end of three months from birth the reaction of degeneration is present in the

affected muscles, the sooner operation is carried out the better. As a rule the faradic reaction is present in the muscles of a child of two months, so that three months is a safe limit.

If the reaction of degeneration is present when the child comes under observation, operation should be performed. The upper cords of the plexus are easily exposed by an incision in the posterior triangle of the neck. The anterior primary divisions of C 5 and C 6 must be exposed, together with their junction and division, and the origin of the suprascapular nerve. The scar will usually be found in C 5 just at its junction with C 6; in some cases the upper trunk will be found damaged. In other cases the fifth anterior primary division is found torn through. The damaged portion of the nerve must be removed and the ends united in the usual way. No difficulty will be experienced in most cases in bringing the ends together. If there be tension, the shoulder should be elevated and the head inclined to the affected side. If the ends cannot be brought into apposition, or the upper end cannot be found, nerve anastomosis should be carried out. If the lesion involve the lower divisions, it will be necessary in most cases temporarily to divide the clavicle.

After-treatment must be faithfully carried out; if this is done the prognosis is good.

Before operating it is essential to discover that the paralysis is due to a peripheral and not to a cerebral lesion. In the latter case the muscles, though paralyzed, react to the interrupted current, and spastic changes are often present in the lower limb of the affected side. In most of these cases the cause of the paralysis is intracranial hæmorrhage at birth, and should have been treated at the time by trephining; in other cases it may be due to tearing away of nerve-roots and hæmorrhage into the spinal cord. *James Sherren.*

BLACKWATER FEVER.—No specific treatment is known. Quinine is useless, and in some instances has caused the attack, while in other cases its administration has been followed by a relapse. The parasites of malaria, if present before, usually disappear during the first few hours. In the rare cases where they continue to be present during the attack, quinine is necessary, but it is highly exceptional for this to be the case, and even then quinine hydrochloride or hydrobromide must be given in very small doses, ½ to 1 gr. slowly increased. The great dangers of the disease are—(1) *Suppression of urine;* (2) *Death from cardiac failure,* the result of the rapidly developed extreme anæmia; (3) *Hyperpyrexia.*

1. **Suppression of Urine** is the most common cause of death. It will rarely occur when treatment is commenced at the onset of the disease; when very early treatment is not employed, the results are less satisfactory. The hæmoglobin dissolved in the blood acts as a powerful diuretic, and the albuminous materials form casts obstructing the renal tubules—hence the suppression. This rarely takes place where a constant flow of urine is maintained, so that a liberal supply of fluids is necessary from the onset of the disease. Treatment by the mouth is successful, provided that it is commenced at the onset of the disease. In such cases frequently there is no vomiting. If it be not commenced till vomiting has set in, it is not to be relied on, and must be supplemented by saline enemata and saline subcutaneous injections. Some authorities prefer to give nothing by the mouth, and supply the requisite fluid entirely by rectal injections. Frequent administration of water by the mouth (4 oz. or more every hour, or in more frequent smaller doses) will suffice, provided there be no vomiting. If, as commonly occurs, there be vomiting, hourly enemata of warm water (6 to 8 oz. if these amounts are retained) will produce the same free flush. These enemata are retained better if a little salt (1 teaspoonful to the pint) is added. Large subcutaneous injections of sterilized normal saline solution (sodium chloride 0·6 per cent) are equally effective, but painful. The risk of the onset of suppression diminishes after the urine clears, but as at this time the diuretic effects of the hæmoglobin in the blood-serum are removed, the rate of excretion is much diminished. Persistent hiccough is sometimes noted, and is best treated by the application of blistering fluid to the side of the neck over the course of the pneumogastric nerve.

2. **Death from Cardiac Failure** becomes more probable as the anæmia advances, and is rare before the third day. Absolute rest in bed in the recumbent position is necessary. The patient must not be allowed to leave his bed or even to sit up for any purpose. When, as is often the case, there is much restlessness, small doses ($\frac{1}{10}$ or $\frac{1}{12}$ gr.) of morphia,

given hypodermically, will relieve. Alcoholic stimulants in medicinal doses are required after the second day.

3. **Hyperpyrexia** may occur during the hæmoglobinuric period, or some days after the urine has cleared. It must be treated by cold applications, cool baths, etc. It is not malarial, and quinine and antipyretics are useless.

4. **Relapsing Forms.**—In some cases, often before or shortly after the urine has cleared, it again becomes loaded with hæmoglobin. The risks are the same with each relapse, but as these are usually mild, most cases do well, and with each relapse the treatment is the same. In rare cases malaria parasites are present, and in such cases a slow and cautious administration of quinine is indicated.

A large number of drugs have been employed, some of which are injurious. Alkaline diuretics and boracic acid appear to give good results, and Sternberg's method of treating yellow fever has in the hands of Hearsay invariably proved successful. (*See* YELLOW FEVER.)

Convalescence is rapid and usually complete. Iron, arsenic, etc., may be used in the late stages of convalescence. In the early stages they are useless. After leaving Africa, recurrences and relapses may occur for some months, and for longer periods in those in whom such attacks are induced by quinine. In cases where fever recurs after an attack of blackwater fever and it is proved by blood examination to be malaria, quinine hydrochloride should be given, ½ gr. twice a day the first day, and every four hours the second day, 1 gr. every six hours the third day, and so on till the minimum dose that will be effective is reached, and then continued for a full three months in 2- to 3-gr. doses night and morning. Return to Africa or to any highly malarious country is not advisable in a person who has had blackwater fever. If return is necessary, great care should be taken to avoid re-infection with malaria; small doses of quinine should be taken regularly, and all unnecessary fatigue and chills should be avoided. *C. W. Daniels.*

BLEPHARITIS.—(*See* EYELIDS, DISEASES OF.)

BLOOD-POISONING.—(*See* SEPTICÆMIA.)

BLOOD-VESSELS, WOUNDS OF.—(*See* WOUNDS OF ARTERIES AND VEINS.)

BOILS.—A boil is an infective gangrene involving a small area of the cutis, in most instances starting around a hair follicle or in a sebaceous gland; in this respect it is closely allied to acne. When the infective process is more extensive and involves the deeper layers, it becomes a carbuncle. These infective conditions are liable to arise in those who suffer from diabetes or albuminuria, and it is always necessary to examine carefully for these pathological conditions in any case of extensive infection with boils. Apart from these constitutional diseases, patients who suffer from boils usually show a very low resistance to the staphylococcus, a point to be specially considered in connection with the treatment.

TREATMENT.—*Local Treatment* consists chiefly in applying an antiseptic dressing after careful purification of the surrounding skin. In many cases the boil aborts or becomes blind; that is to say, the inflammatory process subsides without suppuration. The general method of covering a boil with a poultice or fomentation is to be condemned, since it tends to disseminate the infection and to cause a fresh crop to erupt.

When once a boil has made its appearance as a conical, red, tender swelling, an excellent form of treatment is to cut out and apply a small piece of Unna's plaster, rather larger than the boil, with a small opening in the middle which should be over the centre of the inflamed area. The boil must be carefully protected from pressure or irritation, either by a pad of gauze or lint, or by means of a celluloid shield.

Another method of treatment applicable to those boils which have come to a head is to snip off the projecting point and to apply pure carbolic with the end of a match to the centre of the area.

Gallois treats cases as follows: A solution is made up of iodine (1 drachm) and acetone (2½ drachms); a probe surrounded with cotton-wool is dipped into this iodacetone and applied to the boils, giving them the appearance of so many 'beauty spots'. A piece

of absorbent material large enough to cover the whole region is soaked in boric acid glycerin (glycerin 6 oz., boric acid 5 drachms), and this is applied as a dressing over the whole area. The dressing is renewed once or twice a day, according to the amount of discharge. To succeed in this treatment, M. Gallois insists that antiseptic precautions should be observed.

In cases where there are considerable induration and pain, relief will be afforded by a free incision into the brawny mass.

General Treatment consists in free purgation and the administration of tonics—iron, arsenic, and quinine. The sulphide and the iodide of calcium have been used with much success. Yeast extract is another valuable remedy in recurring boils. Wonderful results are sometimes obtained from the administration of dilute sulphuric acid in large doses (e.g., 20 to 30 min., well diluted, every four hours).

Vaccine Treatment.—The condition of furunculosis, or the general development of boils, being due to a lowered resistance to a staphylococcal infection, Wright has treated patients by means of a staphylococcal 'vaccine', the object being to increase the opsonic index and so the general resistance to this micro-organism. The results of this method fully justify its wide application. (*See also* BIER'S HYPERÆMIC TREATMENT.)

W. H. Clayton-Greene.

BONE, INFLAMMATIONS OF.—Inflammation of bone may be acute or chronic. The acute cases are almost invariably due to the invasion of the bone by pyogenic organisms, while the chronic ones are due generally to syphilis and tubercle; less commonly to the *Staphylococcus aureus* and *albus*. The typhoid bacillus is occasionally responsible for cases of chronic and subacute inflammation. The staphylococci are the principal causal agents in the production of acute inflammations; less frequently the *Streptococcus pyogenes*, and rarely the *Pneumococcus*.

Usually the disease starts at the growing end of the diaphysis of a long bone of a child or adolescent. The terms 'acute infective periostitis' and 'osteomyelitis' indicate the part of the bone principally involved. 'Acute diaphysitis' reminds the surgeon of the site of the original infection. In infants, the epiphysis may be the seat of the process, and as in this case the joint is invariably infected, the condition is often known under the name of 'acute arthritis of infants'. The old name, 'acute necrosis', indicates the almost invariable effect on the bone of the more virulent forms.

The view has been expressed by some surgical writers, particularly in France, that invasions of bone by pyogenic organisms of minor degrees of virulence may be responsible for inflammatory processes which either resolve or give rise to exudations differing materially from pus. This view of the pathology of such conditions finds expression in the terms 'growth fever' and albuminous or serous periostitis or osteomyelitis.

Growth Fever usually occurs between the ages of seven and fifteen; it may be provoked by fatigue, slight injury, or cold. It affects the more actively growing extremities of the long bones, i.e., the lower end of the femur, the upper end of the tibia, the upper end of the humerus, and the lower ends of the radius and ulna.

The chief characteristics of the condition are areas of deep tenderness near a joint, and increased growth of the limb; there may be accompanying malaise and slight fever. The condition is an uncommon one, and its chief interest lies in the diagnosis, as it is frequently mistaken for early tuberculous disease of the neighbouring joint. A few days' rest in bed will usually clear the matter up, as the minor affection quickly subsides with rest, and it may be found later that there has been considerable growth of the affected limb. This may be the explanation of the inequality of the lower extremities which is so often found in adolescents, and which may be first noticed after a slight febrile attack.

The treatment consists in rest, with tonics and fresh air. Care must be taken that no weight or strain is placed on the bone so long as there is tenderness. Salicylate of soda will relieve the pain when the latter is marked.

The treatment of cases of acute microbic invasions of bone has to be considered under two heads: (1) The treatment of the acute condition; (2) The treatment of certain sequelæ and complications.

Acute Infective Periostitis and Osteomyelitis.—These cases belong to the class of surgical emergencies. Their treatment is by immediate operation. An incision should be made down to the bone, over the area of maximum tenderness, the periosteum incised, and the pus, if any, liberated. In almost all cases the medullary canal should be opened,

either by a trephine or a gouge, and, if pus be found, a spacious gutter should be cut in the bone, exposing the interior of the medullary canal, until a healthy area is reached.

The question of the necessity of exploring the medulla will always arise, and should be answered in the affirmative in all but a very few cases. The incision should be planned to avoid important structures, particularly nerves, but at the same time should be made as near to the point of maximum tenderness as is possible. The frequency with which the disease originates at the growing end of the diaphysis, almost invariably selecting the more fertile of the two extremities, is a useful guide to the surgeon in planning his incisions. Counter-openings should be made for drainage, and this must be free. For this reason tubes appear to be more useful than gauze or worsted. The use of powerful antiseptics in these cases is still a moot point among surgeons, some preferring to paint the infected area with 2 per cent solution of iodine in spirit, or with pure carbolic acid, while others, eschewing the use of antiseptics entirely, irrigate the wound with sterilized saline solution. The latter procedure certainly has the support of modern research, which has shown us that chemical substances inhibit phagocytosis, the most important part of that reactive process whereby the organism resists microbic invasion. In those cases where the pus is offensive, swabbing the infected area with peroxide of hydrogen appears to be of benefit. In many cases it is obvious, at the time of the operation, that a large portion of the diaphysis is dead, and in a few cases of bipolar diaphysitis, where the process has simultaneously involved both extremities of the shaft, the diaphysis has been found practically loose in an abscess cavity. It is rarely, however, wise to remove the dead bone at this stage, because it is practically impossible to foretell the exact limit of the necrosis, and therefore either too much or too little bone might be removed. This particularly applies to cases in which, at this stage of the disease, it would appear that a certain length of the shaft is dead throughout its whole length ; yet the sequel of the case shows that the necrosis is limited to a thin cylinder of compact bone, and that the cancellous bone inside this cylinder, though infected, is still capable of recovery. At this stage, therefore, the surgeon's endeavour should be to provide adequate drainage, particularly of the medullary cavity. Convalescence is necessarily slow, with continuous suppuration, while the involucrum, or shell of new bone, is being formed and the sequestrum is separating. With careful dressing to avoid contamination by other organisms, the suppuration can be reduced to a minimum, and the discharge from the sinuses is often practically clear. Such a case may run a painless and afebrile course.

The limb must be carefully splinted, lest fracture of the newly-formed shaft should occur. The patient should, however, be allowed out of doors, on a couch or spinal chair, as both sunlight and fresh air are important factors in maintaining the general health, and in thus aiding the processes by which the sequestrum is separated. It must be borne in mind that separation of the sequestrum belongs to the vital process of repair, and is inhibited by sepsis and excessive suppuration. Surgical cleanliness is therefore imperative, to prevent the ingress of new microbes. The surgeon of to-day has, in addition, a useful weapon in vaccines, which increase the patient's resistance to staphylococci. It is usually better to prepare the vaccine from a cultivation of the patient's own pus.

The few cases in which it does not appear necessary to drain the interior of the bone are those where a considerable subperiosteal abscess has formed with only slight constitutional disturbance. Such cases, however, require careful watching, and, if the temperature does not subside after simple incision and drainage of the abscess, a second operation must immediately be undertaken to explore and drain the interior of the bone.

Removal of the Sequestrum.—The selection of the best time to remove the dead bone requires careful consideration. The sequestrum should be removed at the earliest moment after it has become loose or its limits have become so clearly defined as to enable the surgeon to remove the whole of it without encroaching unnecessarily on the surrounding bone. Time should be given for the formation of an involucrum of new bone sufficiently strong to withstand the pull of the muscles and to sustain the weight of the recumbent limb. This shell of new bone appears to be moulded on the old and dead shaft. This fact constitutes an important reason for waiting a longer time before removing the sequestrum in the case of the femur and humerus, because neither of these has a companion bone to act as a splint and to maintain the shape of the limb while the new bone is consolidating.

Röntgen rays are of use in locating the sequestrum and demonstrating its size and

shape. In a recent case the newly-formed bone is more pervious to the rays than the sequestrum, and therefore the latter appears as a dark shadow surrounded by a lighter shadow representing the involucrum.

The incision in the operation of sequestrotomy must be an adequate one, and must be planned to avoid important nerves, e.g., the musculospiral above the elbow. It should bear a close relation to the existing sinuses, and these should be disinfected, as far as possible, with solution of iodine or with pure carbolic acid, at the commencement of the operation. The new bone must be chiselled or gouged away, and the sequestrum thoroughly exposed. The granulation-lined cavity, in which the dead bone has lain, is carefully scraped and cleaned, and its interior systematically searched for minute fragments of dead bone. In order to facilitate the thorough search for outlying pockets of the main cavity, some surgeons render the limb bloodless by raising it and applying an Esmarch's tourniquet above. After the cavity has been carefully cleaned and the wound irrigated with sterile saline solution, the whole wound is lightly packed with gauze soaked in a mixture of bismuth, iodoform, and paraffin, or with gauze boiled in vaseline, and this must be repeated daily, the wound being allowed to granulate up from the bottom. At the same time the skin edges of the wound must be encouraged to grow into its depth, and thus to cover the granulating surface. Sometimes the size of the cavity may be diminished by pressing together the soft newly-formed involucrum, or the healthy compact tissue may be chiselled through to allow the two walls to meet and to obliterate the cavity from which the sequestrum has been taken. The success of these measures depends entirely upon the degree of asepsis of the cavity. As a rule, if all the sequestra have been removed and only healthy bone remains, the cavity granulates up with surprising rapidity without the use of any such devices; whereas, whatever means be employed, failure is often the result if the cavity is markedly septic. It is therefore to the maintenance of asepsis that the surgeon must chiefly direct his attention.

Bier's method of treatment by passive congestion is often of distinct value in these cases, and the application of a Martin's rubber bandage to the limb above the wound area, for two hours daily, often expedites the separation of the sequestrum, and afterwards hastens the closing of the cavity.

The Question of Amputation will arise at two periods.

1. During the original acute attack. It is, however, questionable whether an amputation will save a patient who, at the onset of the attack, is poisoned to an extent sufficient to suggest the need of such a drastic measure. Such a patient is probably suffering from an acute septicæmia, and an operation of such severity merely depresses him still further, without very materially decreasing the toxæmia, which is due to a general infection of the circulating fluids and of important viscera. The case differs somewhat when there is, in addition to the bone disease, suppuration in the neighbouring joint. In this case it is possible that the majority of the toxins are being manufactured in the infected area, and are being absorbed into the general circulation through the medium of the synovial membrane, which possesses a special capacity for absorption. Amputation rids the patient of this absorbent area, and therefore early operation is often imperative in a case of infective osteomyelitis of marked virulence, in which there is also suppurative arthritis of the neighbouring joint. One exception to this general rule must be made in the case of acute arthritis of infants, in which form of the disease incision and drainage would probably show a lower mortality than would amputation; but in these cases, whatever be the treatment, the mortality is exceedingly high. During the last few years the writer has also seen several cases in which an osteomyelitis of the femur of a moderate degree of virulence was accompanied by pus in the knee-joint. As, in all these cases, the evidences of constitutional toxæmia were not very marked, the joint was merely aspirated and the femur drained in the usual manner. Very satisfactory results were obtained, with a movable joint in each case. The question, therefore, of amputation must be decided on the degree of constitutional toxæmia present.

2. The second period at which the question of amputation has to be discussed is after the acute attack has subsided. It may then be evident that the patient, worn out with prolonged suppuration, is suffering from chronic toxæmia, as shown by hectic fever and evidences of lardaceous disease. Attempts have probably been made to remove the dead bone, but these efforts have been only partially successful, owing to the delayed separa-

tion of the sequestrum. This delay is due to the inhibition of the processes of repair by sepsis. Secondary hæmorrhage, or septic thrombosis, may have occurred, owing to the implication of the coats of an adjacent vein. Under such unhappy conditions, amputation is often the only treatment which will save life, but the question of its employment must be decided with reference to each particular case.

Since the more thorough appreciation of surgical cleanliness, such cases have become very much less common, and should become even more rare now that we have the means of increasing the patient's own powers of resistance to the infecting micro-organism.

The treatment of **Acute Infective Osteomyelitis of the Cranial Bones** when, as occasionally happens, it gives rise to œdema of the scalp and to intracranial suppuration (the condition known as 'Pott's puffy tumour'), must be conducted on the above lines. In this case, however, a disc of bone should be invariably removed, to secure drainage of the interior of the skull.

Chronic Osteomyelitis and Periostitis may be due occasionally to pyogenic organisms. The clinical forms under which this may occur are: (1) One form of abscess of bone; (2) Quiet necrosis; (3) Necrosis with suppuration; (4) Albuminous or serous periostitis, due to subacute infection by an attenuated culture of *Staphylococcus aureus* or *albus*.

The chief interest in these cases lies usually in the question of diagnosis, as they are often mistaken, on the one hand for growths of bone, and on the other for tubercle or syphilis.

The treatment is incision, the removal of any sequestrum, and drainage. It is particularly in these chronic cases that the inoculation of a specific vaccine is of value, as is also Bier's treatment by passive congestion. Various plastic operations have been devised with the object of filling up the cavities in bones from which sequestra have been removed. Flaps of bone with periosteum, or periosteum and muscle, have been utilized for this purpose. Should the cavity which is left after the removal of a sequestrum not show signs of closing in spite of careful and aseptic dressing, the most satisfactory procedure is to cut away the sides of the cavity so as to render it as shallow as possible, to allow the soft parts to grow into it. Occasionally a Thiersch's skin-graft can be utilized to cover a central area over which the skin has not grown. The war has left us with a large number of septic bone cavities and sinuses, the results of old compound fractures. Various as are the measures adopted by different surgeons to deal with these, it is universally agreed that the first essential to success is the practical sterilization of the cavity. Filling the cavities with various pastes or with compositions of wax, etc., has proved, on the whole, very disappointing, as has also the use of decalcified bone and bone chips. The two methods which have met with most success have been the bevelling of the walls of the cavity down to allow the soft parts to grow in, or the turning of a pedicle-flap of muscle into the cavity and closing the skin over it.

The long sinus leading to a small remaining area of septic osteitis, where no obvious sequestrum is present, sometimes yields to syringing with hypertonic saline followed by the use of a Bier's suction glass.

In certain long-standing and recurrent cases of chronic septic osteomyelitis, Charters Symonds has employed continuous drainage by means of metal drainage tubes, and has allowed the patient to walk about. This method of treatment appears to be well worthy of an extended trial in selected cases. *V. Warren Low.*

BONE, TUBERCULOUS DISEASE OF.—The general treatment for tubercle of bone, as for localized tubercle elsewhere, must be directed towards two objects, viz., preventing the spread of the disease locally and its dissemination generally, and increasing the patient's power of resistance to the disease. This latter property has been found to reside chiefly in the circulating fluids, in the shape of certain protective or bactericidal substances, of which the agglutinins, bacteriolysins, and opsonins are examples. It is therefore essential to increase the quantity of these substances present in the blood, and also to augment the circulation through the affected area, in order to flush the diseased tissues with a maximum quantity of lymph charged with protective substances.

It often happens that the diseased area is practically shut off from the action of the circulating fluids, owing to its being surrounded by inert material, granulation tissue, or

pus, which has been deprived practically of all protective substances. The mechanical removal of this material is therefore an important and essential part of the treatment.

With these principles in view, the details of treatment vary somewhat with the bone affected.

In all cases the most important measure to prevent extension or dissemination of the disease is physiological rest. The diseased bone must be relieved of all strain, whether produced by the weight of the body or by muscular action. Disease of the vertebral column requires the supine position. Careful splinting, to include the joints above and below the affected bone, is required when a limb is the seat of the disease.

The next most important factor in preventing extension or dissemination of the tuberculous focus is freedom from contamination by pyogenic organisms. This point has chiefly to be considered under the head of operative procedure, but it has also to be taken into account at all stages of the disease, as it is particularly important that a migratory tuberculous abscess should not become contaminated either by opening on the surface of the body, or, as occasionally happens, by coming in contact with a viscus, e.g., the kidney or bowel.

It has been abundantly shown, both clinically and experimentally, that tuberculous infections of bones and joints are more prone to become disseminated in the blood-stream and to extend more rapidly locally, when there is contamination with pyogenic organisms. This fact was responsible probably for a prejudice that once existed among experienced practitioners against opening tuberculous joints. This measure was stated to increase the risks of generalized tubercle. Increased resistance of the patient's tissues and circulating fluid to the tuberculous invasion can be obtained by (1) Open-air treatment; (2) Inoculation of small doses of Koch's tuberculin.

The value of fresh air and sunshine in the treatment of scrofulous glands and joints was realized at an earlier period than was the importance of the same agencies in the treatment of pulmonary tubercle; yet, while for some time ample provision has been made for the open-air treatment of pulmonary tubercle, only within recent years has the importance been emphasized of providing equal advantages for patients suffering from what is known as surgical tuberculosis, and even now the provision is far from adequate. Properly organized open-air treatment is, however, of the greatest value in these cases of osseous tuberculosis, and should be combined with absolute rest of the affected bone. It must always be borne in mind that these patients should not be treated together with sufferers from pulmonary disease, because the former are liable to pulmonary infection in a greater degree than are healthy persons.

The question of feeding is an important one, the essentials being a plentiful supply of easily assimilable food, and the absence of any fresh infecting material. For this reason, the milk supply should be above suspicion, and the dietary should contain sufficiency of animal fats in an appetizing and easily digestible form. Cod-liver oil is invaluable in these cases, and is usually prescribed with iron or maltine, the latter combination being the more palatable.

The treatment of localized tubercle by the inoculation of small doses of Koch's new tuberculin has now been firmly established. The doses are smaller than those at first employed; $\frac{1}{50000}$ to $\frac{1}{10000}$ mgrm. is the amount usually given. Tubercle of bone, being a good example of localized tubercle, is well suited to inoculation treatment, and by means of it excellent results have been obtained.

'Open-air treatment' and inoculation are alike directed to increasing the amount of protective substances in the patient's blood and lymph. In order to bring the maximum quantity of these protective substances into contact with the diseased tissues, it is essential to increase the circulation through the infected area. This object is achieved by various forms of mild local stimulation, such as application of Scott's dressing, or painting with iodine. Fomentations have the advantage of being anodyne, and at the same time they are a cleanly means of stimulating the local circulation. If pain is a prominent symptom, the parts may first be painted with glycerin of belladonna. If a sinus be present, or the skin be infected, the material employed in fomentation should be impregnated with boracic acid. Of recent years, Bier's method of treatment by producing local congestion has been extensively used in this country, and its employment has been attended with a considerable measure of success. This method is applicable only to cases of local tuberculosis in

limbs, and consists in constricting the limb by means of a light elastic bandage—e.g., a Martin's bandage. The constricting force should be sufficient to block the venous return without interfering with the arterial supply. The constriction should be applied for periods varying from two to three hours or more, and can be repeated daily. (*See* BIER'S HYPERÆMIC TREATMENT.)

With the earlier diagnosis of tuberculous osteitis, and with the therapeutic measures outlined above, which endeavour to imitate the natural process of cure of the disease, the necessity for operation ought to become increasingly less. There will still, however, remain a number of cases in which the mechanical removal of a sequestrum, or the liberation of pus, will be necessary in order to permit access of the circulating blood and lymph to the diseased tissues. Such operations must be performed under the most stringent asepsis, and this must be maintained during the after-treatment. For this reason it is important to avoid, as far as possible, the use of drainage—always a prolific source of wound infection. The sequestrum should be removed, or the pus liberated, the cavity carefully wiped out with sterile gauze, and the wound closed. It is possible, in the case of an abscess, that this operation may have to be repeated ; but the result of two or even three such operations is preferable to the older method of incision and drainage. It is questionable whether any useful purpose is served by such chemicals as iodoform, sulphur, zinc chloride, or pure carbolic acid in the abscess or bone cavity. Such substances inhibit the natural processes of cure, while the patient's own lymph, with which the parts are flushed after the removal of the pus, is the most suitable bactericidal agent for his own case. In order to avoid infection of the surface wound by the abscess cavity, the deeper structures should first be sewn up with catgut stitches. Should the circumstances of the case render an aseptic operation difficult of accomplishment, it would be better to aspirate the contents of the abscess cavity rather than to risk the formation of a sinus. Under suitable conditions of rest and open-air treatment many such tuberculous abscesses have been cured by simple aspiration. This has been amply illustrated at the Maritime Hospital, Berck-sur-Mer, and at Treloar's Home at Alton, where excellent results have been obtained after aspiration of abscesses in connection with tuberculous bone disease. Drs. Gauvain and Calvé, writing in connection with these hospitals, also advocate the use of certain modifying liquids, e.g., iodoform dissolved in ether 5 to 10 per cent, or camphorated thymol (2 parts of camphor and 1 part thymol dissolved in equal parts of sulphuric ether) ; 2 to 5 c.c. of either of these fluids are carefully injected into the abscess cavity from which the pus has been aspirated, and the needle is allowed to remain in position while the vapour resulting from the volatilization of the ether escapes.

The present writer, in preference to the use of these chemicals, washes out such abscess cavities with sterile hypertonic saline 3 per cent solution by means of a Record syringe with a two-way tap.

The formation of a sinus is always a serious complication in a case of tuberculous osteitis. It invariably means a double infection, and we have to deal with a pyogenic as well as a tuberculous invasion. Operations in such cases are not aseptic, and there is always a risk of an extension locally, or even of a general dissemination, following any operative interference. General treatment, including rest and exposure to fresh air and sunshine, must be persevered in ; while local measures, such as boric acid fomentations and Bier's 'compression', must be directed to increasing the lymph circulation through the infected area. Inoculation is necessary to raise the power of resistance both to tubercle and to the special pyogenic organism which has been found to be most prevalent in the sinus. This is generally a staphylococcus. The presence of a sequestrum, as shown by the probe or by the *x* rays, or as suggested by the persistence of the sinus in spite of treatment, will require operation.

In such a case, the operation should take the form of a deliberate search for a necrosed area of bone, and should not consist of the vague scraping procedure so often employed on these occasions. It is unfortunately impracticable, as a rule, to close the wound entirely, and therefore drainage is necessary, with the usual result of another sinus. This second sinus may, however, close after prolonged treatment, but until it does so its presence is always a source of danger to the patient. Indeed, it cannot be too strongly emphasized that the most important point in the treatment of tuberculous osteitis is the prevention of sinus-formation.

A case of uncomplicated tuberculous osteitis is seldom fatal; nor is amputation often necessary when the disease affects a limb. Such cases are invariably due to secondary infection with other organisms, and call for the principles of treatment set forth in the article on pyogenic diseases of bone. (*See* BONE, INFLAMMATIONS OF.)

The treatment of tuberculous osteitis may be summarized by the following examples. Should the disease affect the trochanter of the femur, with a cold abscess in the thigh :—

1. Rest on a couch or bed with a Liston's or Thomas's hip-splint.
2. Exposure to open air and sunshine.
3. A diet including plenty of milk and of animal fats.
4. Inoculation with small doses of Koch's new tuberculin.
5. The abscess should be carefully aspirated, and its cavity washed out with hypertonic sterile saline solution by means of an aspirating syringe with a two-way tap. Should this measure fail, or an *x*-ray photograph demonstrate the presence of a sequestrum, the abscess must be opened under the strictest asepsis, the sequestrum removed, and the cavity closed by buried catgut stitches, the skin being sewn up separately.

A case of tuberculous osteitis of one of the phalanges in a child would require, as before, open-air treatment and splinting, with fomentation. Bier's compression is particularly useful in these cases. Therapeutic inoculation should also be employed, when the circumstances of the case allow it. If there be evidence of pus-formation, or if the *x* rays show the presence of a sequestrum, an incision must be made, the pus liberated or the sequestrum removed, and the skin carefully sewn up again. It is rarely necessary to remove the finger, and the majority of cases recover, though occasionally the resulting finger is shortened and stiff, and the patient prefers to have it removed. It is better, in spite of this possibility, to defer amputation in such a case until the disease is cured, as it is impossible to foretell what the result will be in any individual case, and the most unpromising ones have healed, leaving a useful limb.

(*See also* JOINTS, TUBERCULOUS DISEASE OF THE ; PULMONARY TUBERCULOSIS ; and SPECIFIC THERAPY.) *V. Warren Low.*

BONE, TUMOURS OF.—Osteomata may be compact or cancellous. The former occur in connection with the cranial bones, and are sessile tumours composed of dense compact tissue of the consistence of ivory. Their removal is rarely within the range of practical surgery. Should, however, the position and circumstances of such a tumour demand an operation, the surgeon must not forget that the bone forming the tumour is extremely hard, so that, unless the incision for its removal can be carried entirely outside the tumour, and in healthy bone, it is necessary to make use of mechanical saws and drills of fine temper, and worked by an easily controlled motor.

Cancellous or spongy osteomata are usually pedunculated tumours, and grow in the vicinity of the epiphyseal lines of the long bones. They are often symmetrical. Their removal, when necessary, is an easy matter ; the soft cancellous bone at the neck of the tumour is easily cut with a chisel or bone forceps, and the tumour shelled out from the adjacent soft parts. Strict asepsis is necessary, as these tumours grow in the close vicinity of joints. By their removal, also, the cancellous tissue of the bone to which they are attached is opened.

Subungual exostosis is an irregular outgrowth of bone which occasionally occurs on the ungual phalanx of the great toe, pushing up and deforming the nail. It is probably inflammatory in its nature, and arises from the pressure of unsuitable boots. Its removal is effected with a sharp spoon, after the nail has been removed. Recurrence is probable unless properly shaped boots are worn.

Chondromata occur in connection with bone, and may occasionally require removal. They are often multiple and symmetrical, and occur most frequently in connection with the phalanges and metatarsal or metacarpal bones. They are definitely encapsuled, and can, as a rule, be easily shelled out of their capsule. In the majority of cases this simple measure is successful.

Myelomata.—Pathologists now differentiate between myeloid sarcomata of bone and pure myelomata, and have removed the latter from the category of malignant tumours. These tumours consist almost entirely of large multinuclear cells, and grow in the medullary cavity of the shafts of long bones, immediately adjacent to the epiphyseal cartilage.

The diagnosis between a myeloma and a myeloid sarcoma can be made only by the careful examination of properly prepared microscopic sections, and this should be carried out by an expert pathologist in conjunction with the surgeon. The portion of growth required by the pathologist must be removed by a formal operation, and the incision carefully closed.

When the diagnosis has been firmly established, a myeloma may be dealt with by enucleation, or by resection of part of the bone. The former operation is more suitable when the tumour is completely contained within a cavity in the bone, and can be easily separated from the wall of the cavity. Enucleation is also a more suitable operation where resection is impracticable, as in the lower end of the femur and upper end of the tibia. In the case of the radius, ulna, clavicle, and fibula, resection of part of the bone should be performed. It cannot be too strongly insisted upon that in the case of the humerus and femur, where the diagnosis is in any doubt, it would be safer to amputate at once.

Endotheliomata may occasionally implicate, by their extension, the cranial bones, and also the mandible. In connection with these tumours, it must be remembered that they appear to possess only a local malignancy, and this not always of a particularly marked type. Consequently, operations, such as would scarcely be justifiable were the tumour a sarcoma, may be undertaken for their removal, as even in cases where apparently portions of the tumour have been left behind recurrence has been delayed, in some instances indefinitely, and the patient's condition has therefore been considerably relieved.

Cysts of bone, with the exception of the rare parasitic cysts, are of uncertain pathology. Some appear to be new growths which have undergone degenerative changes, while others are undoubtedly of inflammatory origin and represent an osteomyelitis due to organisms of a low degree of virulence. The treatment of these cysts of bone varies with the view held as to their nature. Surgeons who are impressed with the frequency with which bone cysts are due to a chronic inflammatory condition, are content to empty the cyst, scrape out the lining membrane, and either fill the cavity with some stopping, as bismuth paste or iodoform wax, or, when the enveloping bone is thin and brittle, to place an ivory rod in the medulla to act as a splint or framework while the new shaft is being formed. Others who believe these cysts to represent new growths, whether innocent or of a low malignancy, prefer to excise the portion of bone in which the cyst is situated, and either to replace it by a rod of ivory (in one case an ebony rod was used with great success), or to transplant a piece of living bone, preferably from the patient, e.g., a portion of the fibula, a graft from the tibia, or a rib. Excellent results have been recorded by both these methods. The writer prefers an ivory rod in the case of the upper extremity, or when the excision has been subperiosteal and only a small portion, 3 to 4 inches, of the bone has been removed. For the lower extremity, and where some 7 or 8 inches of bone have been removed, the fibula from the same patient is preferable.

Sarcomata of bone may be central or periosteal. Both varieties occur more frequently at the extremities of the long bones than at the centre of the shafts. The bones of the lower extremities are more frequently affected than those of the upper.

The treatment of all cases of sarcoma of the bones of the extremities should be amputation of the limb well above the tumour. Wherever possible, the amputation should be by skin flaps with circular division of muscles. In nearly all cases, the affected bone should be removed, so that the site of the amputation is usually at the joint above the tumour. In the case of a round-celled sarcoma of the tibia, it should be through the lower third of the femur.

A few exceptions to the general rule that the affected bone should be removed may be quoted. In the case of a sarcoma of the lower end of the tibia or fibula, in which an adult tissue, as cartilage or fibrous tissue, predominates over the cellular elements, amputation may be performed through the upper third of the leg.

In the case of a round-celled sarcoma of the femur, unless the diagnosis has been made within a few weeks of its earliest appearance, the prognosis is so extremely bad that it has been a question whether the patient should be subjected to such a severe operation as an amputation at the hip-joint, since even this offers only a small prospect of ultimate cure. The palliative measure of a subtrochanteric amputation has therefore been suggested, since it presents fewer immediate risks, and will at the same time save the patient the miseries that attend a fungating and septic growth. But, on the other hand, an amputation at the hip-joint does slightly improve the prognosis in these cases, and the immediate

dangers of the operation may be lessened by careful provision against shock and against loss of blood by carefully tying the main vessels at the commencement of the operation. The writer is therefore of opinion that the major operation should be performed in all cases of sarcoma of the femur. Only skin flaps should be employed, and the muscles should be cut as short as is practicable.

In the case of a sarcoma of the humerus, Paul Berger's amputation of the upper extremity appears to give a lower mortality than amputation at the shoulder-joint. As sarcoma usually affects the head, or the upper third, of this bone, Berger's operation is in every way the more suitable one. Unfortunately, the prognosis, in respect of recurrence, is extremely bad in these cases.

Sarcomata, either central or subperiosteal, occur in the clavicle, scapula, jaw-bones, and occasionally in the ribs, and may be amenable to surgical treatment, if discovered early enough to justify excision of the affected bone. Sarcomata of the cranial bones, vertebræ, and pelvis are rarely fit cases for operation.

The writer's experience of the use of Coley's fluid for inoperable cases of bone sarcoma has been uniformly disappointing, and there appears to be little justification for its use in such cases. The burying in the tumour for twenty-four hours of a large dose of radium or radium emanation appears to offer some slight hope of success. At present, however, the reported cases are so few in number, and the evidence of the nature of the growth in some of the successful cases so equivocal, that this method of treatment can be regarded as being only in its experimental stage. *V. Warren Low.*

BORBORYGMI.—Excessive rumbling in the bowels is usually a sign of a neurasthenic state. It may therefore be necessary in extreme cases to put the patient through a rest cure (*see* NEURASTHENIA). In milder cases the diet should be regulated as for FLATULENCE (q.v.), sweets, pastry, and tea especially being forbidden, the bowels regulated, and a firm abdominal binder or support ordered. *Robert Hutchison.*

BRADYCARDIA.—This term is applied to an undue slowing of the pulse-rate. Patients who manifest an infrequent pulse may be divided into four groups.

1. There is slowing of the whole heart. This is not necessarily an indication of disease. A pulse-rate of fifty is not infrequently found in persons of sound constitution, in whom it is an idiosyncrasy and consistent with excellent health.

A true bradycardia in which all the chambers of the heart are involved is common during the period of convalescence, especially in adolescents, and is of no significance.

Intracranial pressure, and toxins such as tobacco, tea, influenza, uræmia, and diphtheria, by their influence on the sino-auricular node, may also slow the heart.

2. Recurring extrasystoles, or premature and ineffective beats; they may be so feeble that they are not represented by an appreciable pulse-wave at the wrist.

3. Cases of auricular fibrillation or auricular flutter under the influence of digitalis, strophanthus, or squills. In patients suffering from auricular fibrillation, the members of the digitalis group tend to induce the 'coupled beats' so characteristic of their action in such cases; the second systole of each couple fails to send a perceptible pulse to the wrist, the pulse-rate then being half of that of the heart. This form of arrhythmia may be mistaken for recurring extrasystoles. In such patients the bradycardia may be of a marked grade.

In a few instances, administration of the digitalis group to patients suffering from auricular fibrillation produces complete block, and the ventricles then beat independently of any stimulus reaching them from the auricles, and at a very slow rate.

4. Patients in whom there is an interference with the conducting powers of the junctional tissues, eventuating in complete or partial *heart-block*. In heart-block the auricles beat normally; and when bradycardia is present it results from the blocking of some or all of the stimuli originating in the auricles as they attempt to cross the neuromuscular connection termed the auriculoventricular bundle, or Gaskell's bridge. The block may be incomplete, only a fraction of the stimuli being blocked, or it may be complete, in which case no stimuli reach the ventricles from above. The ventricles then contract steadily—about twenty-eight to thirty-two beats per minute.

Where bradycardia is associated with periods of stoppage of the ventricles, the

patient suffers from recurring attacks of loss of consciousness and convulsive twitchings. This complex is known as the *Stokes-Adams syndrome*. The periods of ventricular stoppage are characterized by symptoms varying in degree, the severity depending on the duration of the stoppage. There may be nothing more than a transient maziness, but complete syncope is not uncommon; and if the ventricular stoppage is prolonged beyond fifteen to twenty seconds, epileptiform convulsions appear. The severer form of attack may prove fatal.

TREATMENT.—The treatment of bradycardia depends on the recognition, in each instance, of the essential cause of the tardiness of the pulse.

Where the action of the whole heart is involved, as in those healthy individuals who habitually present a slow pulse, or in the bradycardia of convalescence, no specific treatment is required, and the less the heart is tinkered with the better.

When the bradycardia is merely an evidence of excessive indulgence in alcohol, tea, or tobacco, the line of treatment is obvious; this bradycardia is rarely such as to endanger life, and with the removal of the cause the pulse-rate will gradually increase. If the bradycardia is extreme and persistent, massage and baths prove helpful.

The same line of treatment can be carried out in the toxic bradycardias sometimes met with in diphtheria and influenza. Strychnine is useful as a general tonic in such cases, though it is open to question how far it has any direct action on the heart.

Where the bradycardia is a manifestation of chronic or acute uræmia, the treatment must be eliminative (*see* URÆMIA).

The treatment of many of the patients classed in Group 2 is discussed under HEART, IRREGULARITY OF.

The bradycardia found in patients suffering from fibrillation of the auricles under the influence of digitalis and its allies may be very marked, a pulse-rate of forty and fifty being common. If the whole heart is correspondingly retarded, the digitalis must be stopped.

If the slow pulse is due to coupling of the heart-beats—the second beat of each couple proving ineffectual—it is an indication that the digitalis should be discontinued for a time and then resumed in smaller doses, sufficient being administered to steady the heart without unduly retarding it.

When the arteries are definitely sclerotic, some preparation of iodine should be administered, either the iodide of potassium or of sodium, in doses of 5 to 10 gr., or the tincture of iodine in 5- to 10-drop doses, well diluted with water.

℞	Potassii Iodidi	gr. v	Tincturæ Nucis Vomicæ	℥v	
	Liquoris Arsenicalis	℥iij	Aquam Menthæ Piperitæ	ad ℨss	

A tablespoonful thrice daily after food.

In true *heart-block* the case should be managed very much on the lines described in the article on MYOCARDIAL FAILURE. The use of digitalis is not contra-indicated by the existence of the block if the general condition of the heart demands it. The possibility of syphilis should always be inquired into, and, if the blood reaction is positive, vigorous treatment by mercury and iodides should be tried. For the fits of the *Stokes-Adams syndrome* no treatment is of any use, but the patient should be warned of the danger he runs from falls during the attacks.

It is well to reiterate that the majority of patients suffering from a slow pulse are better without treatment directed to the heart. (*See also* MYOCARDIAL FAILURE.)

John Hay.

BRAIN, COMPRESSION OF.—In all cases of head injury of any severity, constant watchfulness must be maintained for the onset of signs of compression, for it is the early recognition of this condition, followed by the early removal of the compressing agent, that makes a favourable result possible.

The causes of compression of the brain after injury may be classified as follows: (1) Depressed fracture; (2) Foreign bodies; (3) Intracranial hæmorrhage—(*a*) Extradural, (*b*) Intradural; (4) Inflammatory effusions—(*a*) Meningitis, (*b*) Abscess.

In the treatment of compression the obvious indication is to relieve the pressure by operation, and the methods employed will depend upon which of the above-mentioned causes is at work. (*See* SKULL, FRACTURES OF; HÆMORRHAGE, INTRACRANIAL.) The general treatment to be adopted may, however, be touched upon here. The patient is

kept quiet in a darkened room, and an ice-bag may be applied to the head. The bowels are opened by the administration of calomel or of a drop of croton oil in a little mucilage placed on the back of the tongue, followed by enemata. The urine is drawn off twice a day by catheterization. The patient is fed upon liquids by means of a nasal tube passed into the stomach. Stimulants must not be administered. There is a danger lest the patient should suffocate through the rolling back of the tongue. This may be avoided, as a rule, by placing the patient on his side ; should it occur, the tongue is pulled forwards with forceps.

In the milder forms of compression, lumbar puncture may be employed. Fluid should, however, be withdrawn very slowly, and the pulse and respiration carefully watched. The intimate admixture of blood with the cerebrospinal fluid indicates that intradural hæmorrhage has taken place as a result of the head injury. If improvement results, lumbar puncture may be repeated.

In the more severe forms of compression, more radical measures are necessary. Operation is called for, and, if there be no definite evidence pointing to a localized lesion, the operation of choice is a *subtemporal decompression*. Preferably under local anæsthesia, a flap is turned down, the fibres of the temporal muscle are split, a large area of bone is removed, and the dura mater is opened freely by a crucial incision. The muscle edges and skin are then closed.

Death occurs from respiratory failure, the heart continuing to beat for some time after the breathing has stopped. Artificial respiration is therefore called for at times to keep the patient alive while an operation is being performed for the relief of the pressure, the breathing, when this has been done, continuing spontaneously. *S. Maynard Smith.*

BRAIN, CONCUSSION OF.—It is usual for the purposes of description to divide concussion into three stages : (1) *Collapse* ; (2) *Reaction* ; (3) *Convalescence* ; but it must be recognized that the severity of the condition may vary greatly. Thus there may be merely a momentary loss of consciousness, the patient feeling giddy and confused. In cases of severe injury, on the other hand, death may ensue in a few minutes. In the majority of cases, however, which come under the care of the surgeon, the three stages mentioned are sufficiently well marked.

Stage of Collapse.—Whilst employing measures to restore the patient from his condition of collapse, it is of the utmost importance to avoid over-stimulation. It is impossible to say at this stage whether there be any laceration of the brain tissue or rupture of intracranial vessels. Undue stimulation will result in the starting of hæmorrhage from these ruptured vessels, or, by causing hyperæmia of the brain, will predispose to the occurrence of inflammatory affections or of spreading œdema. The patient should be put to bed immediately between warm blankets. Hot bottles are placed around his lower extremities and trunk, care being taken not to cause burns. If the collapse be great, a rectal injection of a pint of warm saline solution should be given. In rare cases it may be necessary to resort to the administration of brandy either per rectum or hypodermically, but the dangers of stimulation must be carefully borne in mind. If the unconsciousness be long maintained, nutrient enemata will be needed, or fluid nourishment may be given by means of a nasal tube.

Stage of Reaction.—The onset of reaction is often marked by vomiting ; the pulse, at the same time, improves, the respirations become deeper, and consciousness returns. When this occurs a purge (calomel 5 gr.) should be administered, followed if necessary by an enema. The diet should for a few days consist of 'slops' : stimulants of all kinds must be avoided, and the utmost care should be taken to avoid all disturbing influences. Thus, the room should be darkened, the blinds being drawn and the lights shaded. The attendants should be warned to avoid noise in moving about the room, in attending to the fire, and in opening and closing the door. Should the reaction be considerable—as indicated by a raised temperature, continued mental disturbance, and severe headache—the head should be shaved and Leiter's tubes applied, whilst free purgation should be persisted in.

Convalescence.—Sufficiently prolonged rest from work and the avoidance of worry and mental excitement are the chief indications. It must be remembered that what may seem, at the time, to be a comparatively slight injury, may permanently unfit the patient for any responsible employment. *S. Maynard Smith.*

BRAIN, LACERATION OF.—More or less laceration of the brain and its membranes is a frequent accompaniment of head injuries. If there be a compound fracture of the skull and the dura mater be torn, the lacerated area is in direct communication with the exterior, and the grave dangers of septic inflammation are added to those directly dependent upon the laceration. It may be said that unless there be a depressed fracture of the skull or unless the violence be localized to a small area, the laceration is most marked at a point diametrically opposite to the point struck (*contre-coup* laceration). Thus it is not unusual to find convulsions and paralyses on the *right* side of the body when it is the *right* side of the head which has been struck, since as a result of the blow there has been a *contre-coup* laceration of the *left* motor area.

Treatment.—It is obvious that in all cases of contusion or laceration of the brain the primary symptoms will be those of Concussion (q.v.). There are, however, several special symptoms which may arise in the course of the case and which call for special treatment. These are as follows :—

1. If there be a wound, the utmost care is taken in its disinfection, as described under the heading of Scalp Wounds. Depressed fragments of bone and foreign bodies are removed, prolapsed brain tissue is cut away, and if possible the torn dura is brought together with catgut sutures, a small drainage tube being left in.

2. If signs of compression, preceded or accompanied by early convulsions or paralyses, ensue, the cause is likely to be hæmorrhage into or upon the surface of the brain. The treatment is given under Hæmorrhage, Intracranial.

3. The peculiar train of symptoms known as 'cerebral irritation', coming on early after an injury, is due to a laceration of the frontal lobe. For treatment, *see* Cerebral Irritation.

4. Convulsions occurring at a later period—usually from the third to the fifth day—indicate inflammatory processes or a spreading œdema originating at and extending from the lacerated area. If the patient be young and the pulse full and hard, venesection to the amount of 10 or 12 oz. may be performed, and full doses of bromides given. If, in spite of this, the convulsions become more general, and the unconsciousness becomes more profound, the lacerated area should be exposed, the dura opened, and the clots removed. If the brain appears swollen and œdematous, a free incision into its substance holds out the best hope of success. In cases where there is no evidence as to the site of laceration, a subtemporal decompressive operation should be done. *S. Maynard Smith.*

BREAST, HYPERTROPHY OF THE.—True hypertrophy of the breasts is uncommon, commences generally at puberty, and is usually bilateral.

Treatment.—In a small proportion of the cases, arrest or diminution of the condition may be brought about by the prolonged application of firm pressure, and the internal administration of iodides. In some cases the hypertrophy is progressive in spite of medical treatment, and partial or complete removal of the breasts, which are functionless, becomes necessary. There are no special difficulties about these operations if they are carefully planned and the hæmorrhage is efficiently dealt with. *Crisp English.*

BREAST, INFLAMMATION OF.—(*See* Mammary Abscess ; Mastitis.)

BREAST, NEURALGIA OF.—Pain may, of course, form one of the symptoms of any affection of the breast, but in speaking of mammary neuralgia one refers to those cases in which pain is the outstanding feature of the case, the local changes being slight or absent. This condition is very commonly met with amongst female patients.

The causes are diverse, and usually unobtrusive ; they may be divided into : (1) Local causes ; (2) Pelvic affections ; (3) Impaired general health. Local and general causes are often combined, and inseparably connected with both is the dread of cancer.

Treatment.—Before commencing treatment, it is essential to get a clear idea of the cause of the pain. Cure can rarely be brought about by merely covering up the breast with plasters or by the application of anodynes.

A very careful search must first be made for slight local lesions, and especially for small patches of localized mastitis. The condition of the pelvic organs must be inquired into, and treatment in this direction be instituted if necessary.

As has already been stated, it will be found that the fear of cancer is at the root of the trouble in the greater number of cases, and reassurance on this point will go far to cure the neuralgia. In fact, many of these patients come to us, not because the pain is a serious trouble, but in order to find out whether they have cancer. When we can honestly reassure them, as is often the case, the pain will usually vanish. If we are confident that there is no local disease, it is well to be emphatic, for any doubt or hesitation on our part will lead to infinitely greater doubt in the patient's mind, and to exaggeration of the pain and worry.

Any local changes in the breasts will demand local treatment, but on the other hand it may be pointed out that, in the absence of local changes, it is often unwise to order local applications, for these will tend to keep the patient's attention to the region, and usually fail to give relief. Where there is mastitis, mercurial ointment and the internal administration of sodium iodide should be used. The local application of *x* rays (half Sabouraud dose repeated three times at fourteen-day intervals) is often efficacious in mastitis cases, and should be given a trial. Should this treatment fail in patients over thirty, it will be wisest to excise the affected area freely. Small fibro-adenomata and cysts should be at once removed, and this step will almost always relieve the neuralgia.

When the general health is at fault, and is responsible for the neuralgia, the indications for treatment are clear. The most useful drugs are iron, quinine, and purgatives. Anæmia and insomnia must be promptly treated. In the neurasthenic cases, rest, general massage, and high feeding, or a change of surroundings, are advisable ; the most effective form of local treatment in these cases is galvanism. *Crisp English.*

BREAST TUMOURS.

1. **Fibro-adenomata.**—Very small tumours, causing no trouble, may be left alone unless the patient desires their removal. Otherwise removal should always be recommended, for the following reasons : (1) These tumours are almost always a source of worry and anxiety to the patient ; (2) If she marries, they usually grow rapidly and give trouble during pregnancy and lactation ; (3) In a small number of cases they ultimately assume a malignant character ; (4) The diagnosis can never be absolutely certain, and tumours supposed to be fibro-adenomata occasionally prove to be early sarcomata or carcinomata, even in young subjects.

No external application of any kind has the slightest influence on the growth of a fibro-adenoma ; liniments, iodine, *x* rays, and other 'absorbent' remedies do nothing but harm.

The operation, although apparently a simple one, requires careful attention to detail. A full anæsthetic should be given ; some recommend the use of a local anæsthetic, but this frequently leads to failure or to a hasty operation, for few women will bear an operation on the breast without a general anæsthetic. The *incision* should be a small one, and should be situated as low in the breast and as near its periphery as possible ; an inconspicuous scar will thus be left ; in some cases a little flap with its convexity downwards may be used in order to get the main part of the scar lower. Many recommend that the capsule of the tumour should be incised and the growth 'shelled out'. Personally, I feel that it is better practice to remove the capsule with the tumour, for cases are met with in which the tumours have recurred locally after being 'shelled out' ; in these cases a small lobule of the tumour has been left behind. Further, it occasionally happens that on microscopical examination the growth is unexpectedly found to be malignant ; the fact that the tumour has been excised thoroughly will then be an advantage in any case ; the complete operation should be strongly advised at once, but it may happen that the patient refuses a second operation, or insists upon waiting for a recurrence. After removal of the tumour, all bleeding points are carefully secured, the cavity is closed by means of buried catgut sutures, and firm pressure is applied. Unless the cavity is closed carefully, a hæmatoma usually forms, and will probably interfere with the union of the wound.

2. **Cysts.**—Cysts occurring in the breast may be grouped under the following headings : (*a*) Simple serous cysts ; (*b*) Multiple cystic disease, including involution cysts ; (*c*) Cysts connected with tumours ; (*d*) Galactoceles ; (*e*) Hydatids.

a. Simple Serous Cysts may occur in the breast apart from the presence of a tumour or intracystic growth.

Treatment.—These cysts may sometimes be cured by withdrawal of the fluid and the injection of two or three drops of pure carbolic acid ; the acid excites inflammation and the cyst refills with fluid, which becomes absorbed in a few days, leaving the cyst obliterated. This method is *not* to be recommended ; the result is uncertain, and moreover many of these cysts, which appear simple, are connected with tumour formation, which can be recognized only by incision ; for instance, there may be a large cyst and a small, early carcinomatous growth. Tapping and injection should be employed only when the patient absolutely refuses the radical operation.

The best treatment is excision ; the resulting cavity in the breast tissue must be obliterated as far as possible by deep catgut sutures, otherwise a troublesome hæmatoma is liable to develop ; a small drainage tube should be inserted and left in for twenty-four hours.

In operating upon these cases it is well to remember that other smaller cysts may be found, that the condition, in fact, is really multiple cystic disease ; or cystic growth may be present. It is desirable, therefore, to obtain the patient's consent to remove as much of the breast tissue as may seem advisable.

b. Multiple Cystic Disease is usually the result of chronic lobular mastitis, and the treatment is based on the same principles as in chronic mastitis. Each case must be considered separately ; in some the cysts may be dealt with one by one as they arise, by injection and tapping, or preferably by excision ; in others, excision of a portion of the breast is indicated ; in many, it is wiser to remove the whole breast.

c. Cysts connected with Tumour Formation (intracystic growths).—If intracystic papillary growths are present, the case should be regarded with grave suspicion, since many of these cases are malignant in type. Free excision should be performed in the first instance, to be followed by a radical operation if the pathological report indicates malignancy. If the cyst is connected with a fibro-adenoma or a malignant tumour, the treatment is that of the tumour.

d. Galactoceles are cysts containing altered milk, which originate in lactation and are due to partial obstruction of one of the larger ducts.

Treatment.—Nothing as a rule should be done until lactation has ceased. The cyst should then be excised, and the cavity obliterated as far as possible by deep suturing ; drainage for twenty-four hours should be employed.

Other methods, such as tapping and injection, free incision and stuffing with gauze, etc., are unsatisfactory, and should not be employed. A suppurating galactocele is treated as an ordinary mammary abscess.

e. Hydatid Cysts are rare, and should be freely excised.

3. **Malignant Tumours.**—The only treatment for malignant disease of the breast is early and thorough operation, provided that there is a reasonable prospect of removal of the disease. Under certain conditions, palliative treatment only is possible. However small and early the growth, operation must not be delayed, for with each week of delay the prospect of cure diminishes. One would also point out emphatically that however small the growth, the extent and thoroughness of the operation should never be diminished, for it is in these early cases that the prospects of cure are especially good.

Radical Operations.—The term 'radical operation' is used for those operations in which an attempt is made to procure a radical cure by the removal of the whole of the disease ; in former days this expression would scarcely have been admissible, in view of the large number of cases in which recurrence took place. The experience of recent years, however, is clearly proving that after the proper performance of the modern complete operations, local recurrence ensues in only a small proportion of the cases, and that a large number of patients escape from any further manifestations of the disease.

The rationale of radical operations for mammary cancer is based mainly on two considerations : (1) The anatomy of the lymphatic system in this region ; and (2) A study of the areas in which the disease reappears after incomplete operations. Before discussing the indications and contra-indications for the radical operation, brief reference must be made to its extent and nature. The following structures are removed in one continuous mass : the whole of the mammary gland and a large portion of the overlying skin ; both

pectoral muscles, excepting the clavicular fibres of the pectoralis major; the whole lymphatic area, including the fascia and fat from the epigastric region below to the clavicle above and to the commencement of the brachial artery laterally. The incision extends from just above the insertion of the pectoralis major, includes a large ellipse of skin, and terminates in the epigastrium midway between the costal margin and the umbilicus.

This is obviously an extensive and very complete operation, but the results fully justify it. The usual duration of the operation is from 40 to 50 minutes: there is rarely marked shock or collapse afterwards if the hæmorrhage is kept at a minimum; and the patient is able to get about at the end of a week or ten days; with proper after-treatment the movements of the arm are scarcely impaired. The prospects of the patients are infinitely better after this operation than if any of the less extensive operations had been performed.

Indications for Operation.—In many cases it is at once clear that operation is the right and proper course; in others it is equally clear that any operation would be futile or even harmful; but there are a great many borderland or doubtful cases, in which every aspect must be carefully considered before a decision is reached.

The best subjects for operation are middle-aged, comparatively thin women, with sound viscera, who have small growths in the outer quadrant of the breast, with slight or no palpable enlargement of the axillary glands. Bad subjects are those who are young and have large breasts, those who are stout and plethoric, the alcoholics, diabetics, bronchitics, those with feeble hearts or diseased kidneys, those who are elderly and have little power of resistance.

The following local conditions exclude any attempt at radical operation: (1) Fixation of the growth to the thorax; (2) Extensive involvement of the skin, either in the form of a brawny induration or of multiple widely-scattered nodules; (3) Implication of the axillary vessels or nerves.

Enlargement of the supraclavicular glands is usually held as an indication that the disease has gained too strong a grip upon the patient, and that operation for palliative purposes only is possible. Some surgeons have practised operations in such cases, and have reported a few successful results. One would say, therefore, that in the majority of cases this complication renders any extensive operation useless, but that in certain cases, with very slight involvement of these glands, extirpation may be attempted.

Atrophic Scirrhus should always be operated upon, if there is any reasonable prospect of completely removing the disease, unless the patient is very old or very feeble. It is true that such cases may go on for a very long time without serious trouble, but ultimately most of them die of internal deposits; on the other hand, if operation is done thoroughly, there is an exceptionally good chance that a permanent cure may result.

Visceral and Bony Deposits of course negative any possibility of cure; very careful search should be made for these before advising operation, for they are easily overlooked when showing themselves as vague 'rheumatic' pains about the limbs or spine, slight pleural effusions, etc.

Diabetes, Cirrhosis, and Renal Disease are formidable complications. The advice of a physician should at once be taken, and, if diabetes is present, a quantitative examination of the sugar in the urine should be made. The question resolves itself into one of the successful performance of an operation under unusual difficulties, and in this respect we are now in a much improved condition. Sepsis, which formerly represented the main danger of diabetes, should nowadays be an almost negligible factor, whilst the precautions which prevent or diminish shock are better known. In diabetics it is advisable to devote a short time to careful dietetic treatment before operation. The increased risk involved by the presence of these complications must be explained to the patient or to her friends, but considering that without operation we are leaving her to die, and to die probably sooner owing to the complication, operation will usually be desired in spite of the increased risk.

In old subjects, say patients over seventy, the question presents very special difficulties. To begin with, a large proportion of these patients will obstinately refuse any operation, even before such treatment has been mentioned, on the ground that they are too old and could not stand any operation. In such cases one can only point out emphatically that no decision should be made until the facts of the case have been carefully

explained and thought over by the patient and her friends for two or three days. The first point is to estimate the patient's practical age, for many of them will be found to be for surgical purposes much younger or older than the actual age given. For this purpose a thorough examination must be made, special attention being paid to the heart, lungs, arteries, and urine. Secondly, a rough estimate must be made of the rate at which the tumour is growing and the length of time which is likely to elapse, if no operation be performed, before it causes the patient's death. Accuracy in a matter of this kind is obviously impossible, but with care and experience an approximate result may be obtained. Generally speaking, of course, these growths are very slow in old subjects, and the older the patient the slower the growth ; in fact, in some it is obvious that the patients are far more likely to die from other causes before the growth is sufficiently advanced to cause them much trouble or to kill them. Thus most cases of the atrophic variety of scirrhus in patients over 70 are best left alone. Thirdly, we have to consider the risk, and this will depend on the general condition of the patient and the difficulty and duration of the operation. In the greater number of cases it will be advisable to limit the duration of the operation to twenty minutes or half an hour.

Pregnancy forms a very serious complication in cancer of the breast. In considering the question of operation, two main facts present themselves—the rapidity with which mammary cancer grows during pregnancy and lactation, and the risk of abortion after the necessarily extensive operation. There are some who advise against operation owing to fear of disturbance of the pregnancy. But the indications are perfectly clear. To leave the patient means rapid increase, and probably fungation, of the growth, and early death ; moreover, there is still a liability to miscarriage or non-survival of the child. On the other hand, miscarriage after removal of the breast occurs in certainly less than half of the cases. Pregnancy should therefore never be considered as an argument against operation when the growth is removable, but should be taken as demanding early and thorough operation.

The question of treatment in cases of *bilateral carcinoma* may at first sight suggest difficulties, but may be decided easily in the following way : Each breast is considered by itself, and a decision made as to whether operation would be advised for the disease in that particular breast, if the other breast were not affected. If one can answer in the affirmative as regards each breast individually, then operation for both sides should be recommended. If operation is decided upon, then the question arises as to whether both sides should be dealt with at the same time, or by two operations. In ordinary circumstances one would prefer to allow an interval of a fortnight or so to elapse between removal of the breasts, but several factors must be considered. There are some subjects whose physical powers would be dangerously taxed by two extensive operations in a short time ; there are some who could not face the prospect of two separate operations ; and there are those disappointing cases, which all surgeons encounter, in which the patient consents to two operations, but after the first refuses to allow the second to be performed. On the other hand, there are practical or placid women who have the moral courage, as well as the physical powers, to face two separate operations. If the breasts are removed at the same time, all the resources of surgical organization are called for ; the work must be done as quickly as possible, though thoroughly, and above all things hæmorrhage must be reduced to a minimum. The best plan is to have a skilled assistant, who can ligature vessels and sew up the wound after removal of the first breast, whilst the surgeon proceeds to removal of the other. The time occupied in suturing the wounds can be reduced considerably by the use of Michel's sutures.

After-treatment.—Immediately the wound has healed, it is advisable to treat the entire operation area by means of exposure to *x* rays, with the idea of destroying any isolated cancer cells which may remain. Careful examination of the patient should be made at regular intervals in order to detect any recurrence at the earliest possible moment.

Palliative Operations.—A great many cases of mammary carcinoma which come under notice are unfortunately obviously beyond the possibility of any radical cure ; but in many of these cases a palliative operation may give much relief. These operations are performed to prolong life, to give relief to pain, to prevent fungation, and to make the patient more comfortable and happy during the time that remains to her.

Removal of the breast as a palliative operation is called for mainly in comparatively young subjects with large, rapidly growing tumours; such tumours often cause much pain, and are a source of great distress to the patient; and when fungation occurs this distress is greatly increased, and the sepsis which almost invariably follows rapidly shortens the patient's life.

The nature of the operation depends on the distribution of that portion of the disease which is causing trouble. In most cases a simple removal of the breast and the most enlarged glands in the axilla is the operation for choice; any elaborate clearing of the axilla is usually inadvisable. In some cases, however, when pressure upon the axillary nerves by enlarged glands is likely, the axilla should be cleared up to the clavicle as in the 'complete' operation. I would strongly insist on one point: in all palliative operations the skin flaps should be so cut that they can be united without difficulty, so that the wound heals by first intention. Unless this can be done I should advise against any operation, for I believe that more harm than good comes of leaving a large raw surface. The very object of the operation, palliation, is usually defeated by inability to completely close the wound; the long convalescence means much distress and disappointment to the patient, and growth often shows itself in the granulating wound, which then of course never closes.

Recurrent disease should be dealt with at once unless obviously irremovable. The most favourable recurrences are superficial nodules in the neighbourhood of the scar; if these are widely excised, no further recurrence usually occurs in that particular region. Large masses of recurrent growth adherent to the chest wall can seldom be dealt with successfully, and for these cases *x*-ray treatment or radium should be tried.

Non-operative Treatment.—There is at present no remedy which can replace, or give any excuse for delay in, operation. Should the disease be obviously beyond operative treatment, nothing can produce any permanent effect on the progress of the disease.

The curious vagaries of cancer account for the supposed success of certain so-called 'cancer cures'. If these remedies are given at a time when the tumour is about to undergo one of these curious pathological improvements, they gain the credit of having worked a marvellous cure.

Strong caustics are painful, dangerous, and excite suppuration. Electricity sometimes relieves pain, and encourages the patient, but is otherwise useless. *X* rays are undoubtedly useful in certain cases; they usually relieve pain, and can cause the disappearance of superficial nodules and the temporary healing of superficial ulceration. There is probably no case in which they have effected a cure, and they have practically no effect on subcutaneous disease covered by healthy skin: occasionally their use excites a sudden inflammatory condition and rapid increase of the growth. Radium may improve or cure local deposits of the disease, but should never be used in place of operation if this is practicable. Some operators place tubes of radium in various parts of the wound at the close of the radical operation.

The injection of Coley's fluid has produced a few undoubted cures in cases of inoperable sarcoma; in the great majority it fails, and its use is attended by marked constitutional disturbance and definite risk. For inoperable sarcoma this treatment may be considered, but in cases of carcinoma its use is scarcely justifiable under present conditions.

Oöphorectomy for irremovable mammary cancer has now received extensive trial, and the results are disappointing. There has probably been no case of true cure, but marked temporary improvement is said to have occurred in about 25 per cent of the cases which have been publicly reported. The best results have been obtained in patients between forty-five and fifty years of age; after fifty no good appears to follow the operation. The mortality amongst the published cases is about 6 per cent. The facts may be summed up as follows: In about 20 to 30 per cent of the cases definite relief and improvement appear to follow the operation; the probability of cure is remote; chronic growths in patients between forty-five and fifty give the best results.

Medical Treatment of Inoperable Carcinoma (*see also* Cancer, General Treatment of, p. 136).—Much may be done to relieve those suffering from inoperable cancer. The medical man must use his discretion as to the amount of encouragement and hope that he gives the patient.

Pain will usually necessitate the use of morphia ; bromides and acetylsalicylic acid give a certain amount of relief in the earlier stages, but morphia usually becomes necessary : if so, it should be given in sufficiently large doses to completely relieve the pain, and steadily increasing doses will be necessary, and are well borne.

The most important point in the local treatment is asepsis ; for if the growth ulcerates and becomes septic, the patient's life is considerably shortened. Antiseptic dressings are regularly applied, and the ulcerating surface should be occasionally painted over with 1–5 carbolic acid. If the surface should become very foul, hydrogen peroxide is the best application. If the growth should cause much pain, one of the following applications recommended by Sheild should be used : (1) Citric acid, 2 drachms to 8 oz. of water ; (2) Freshly prepared succus conii and lanolin, equal parts of ; (3) Cocaine ointment.

Hæmorrhage from an ulcerating surface should be treated with adrenalin solution, or hamamelis lotion, and firm pressure.

Lymphatic Œdema of the Arm.—This is one of the most distressing results of mammary carcinoma ; it is often associated with severe pain, due to the involvement of nerves by growth in the subclavian triangle or high in the axilla. Relief is usually afforded by massage and firm bandaging ; if flexion at the elbow is not interfered with, a sling should be worn. In some cases thyroid extract causes marked diminution in the œdema of the arm, appearing to act as a lymphagogue. In cases of very severe pain, the possibility of relief by operation arises. The pain may sometimes be cured by removal of glands pressing on the nerves ; it may be relieved by division of the nerve trunks, a comparatively simple proceeding, which, however, leaves a paralyzed and still œdematous arm.

Lymphangioplasty has been recommended, and sometimes causes considerable diminution of the œdema. For details of the operation, Mr. Sampson Handley's Hunterian Lectures (*B.M.J.*, April, 1910) should be consulted.

In cases of agonizing pain, in which life is scarcely tolerable, removal of the limb by a circular amputation just below the shoulder should be considered ; in suitable cases this may give great relief. Removal of the whole fore-quarter has occasionally been performed, but is seldom justifiable.

Doubtful Tumours.—The use of the grooved needle or trochar for the diagnosis of doubtful swellings of the breast is to be most strongly condemned : it is both painful and alarming to the patient, and may be very misleading to the surgeon. The trochar is used as a rule to discover whether there is fluid in the swelling ; but in thick-walled cysts it frequently fails to enter the cyst, and leaves one with the impression that the swelling is solid, whilst if fluid is drawn off it tells us nothing of the nature of the cyst ; the cyst may contain intracystic growths or may be connected with a small malignant growth. In the case of solid tumours also the grooved needle gives us no information of any kind, and it seems probable that the puncture of a malignant growth may stir it to increased activity. Exploratory incision should be the routine treatment for all doubtful swellings ; delay is not permissible, for experience shows that the greater number of 'doubtful swellings' prove to be malignant. In nearly all cases, the nature of the tumour becomes at once apparent upon incision, but in some the microscopical evidence must be awaited. Where it is desirable to proceed to the full operation at once if the growth proves malignant, arrangements can be made to receive an immediate report from the pathologist ; the aid of a skilled pathologist is necessary. *Crisp English.*

BREATH, OFFENSIVE.—Local causes, such as carious teeth, pyorrhœa, chronic enlargement of the tonsils, etc., should first be looked for. Assuming these to be absent, attention should be paid to the stomach and bowels. The diet should be regulated on the same lines as for chronic CONSTIPATION (q.v.), and a mild aloetic pill, or a grain or two of cascara along with $\frac{1}{10}$ gr. of calomel, administered every night. If the tongue be furred, the same remedies should be administered as in chronic GASTRITIS (q.v.), and exercise in the open air enjoined. The condition can always be masked if necessary by occasionally sucking an aromatic 'cachou', or a tablet of euthymol. *Robert Hutchison.*

BRIGHT'S DISEASE.—(*See* NEPHRITIS.)

BROMIDROSIS.—(*See* PERSPIRATION, OFFENSIVE.)

BRONCHI, FOREIGN BODIES IN THE.—(*See* FOREIGN BODIES IN THE AIR-PASSAGES AND ŒSOPHAGUS.)

BRONCHIECTASIS.—Before studying the treatment of this affection it is necessary to understand its varieties and etiology, and also the results or complications which may supervene; for it is these that need attention rather than the actual condition, which admits of little if any amelioration, and which, if robbed of these consequences, is compatible with a fairly healthy, useful, and active life.

1. A congenital form occurs (very rare). It is always unilateral, and the other lung hypertrophies, so taking on the work of both.

2. The form due to more or less extensive fibrosis of lung, consequent upon interstitial or unresolved pneumonia or bronchopneumonia, pleurisy, or empyema. This, too, is often unilateral, the other lung hypertrophies, and the patients are often in good health but for attacks of bronchial catarrh, or some of the complications mentioned below.

3. The form occurring with chronic bronchitis and emphysema, or in chronic cases of pulmonary tubercle. Here the treatment is chiefly that of the affection causing it, plus that of complications as stated.

4. The form due to the impaction of a foreign body in a bronchus, or to pressure of an aneurysm, or other tumour, upon one of the tubes. The tubes beyond the obstruction, softened and inflamed by the retained, often decomposed and fœtid, secretion, dilate, and complications are more likely to occur than in any other form.

5. Acute dilatation occurring as the result of excessively frequent and prolonged paroxysms of coughing, usually in the course of pertussis. Treatment of the cough and accompanying bronchitis, with general tonics, we have seen result, apparently, in the complete disappearance of this condition.

It will be seen that in many instances the appropriate treatment will be directed towards the disease causing bronchial dilatation, or in the course of which it occurs; whilst in others only general tonic and hygienic measures are needed. It is the consequences which are most to be dreaded. They are:—

1. Hæmorrhage—(occurred in 14 out of 35 cases—Fowler.)

2. Bronchitis, very liable to recur, often runs a febrile course, and is not uncommonly accompanied by patches of pneumonia.

3. Retention with decomposition of sputum, which is most to be feared, as it may give rise to:—

a. Fœtid bronchitis.
b. Ulceration of tubes.
c. Gangrene of lung.
d. Septic absorption, with secondary abscesses (brain).
e. Empyema.

Hæmorrhage is not generally profuse, and the usual treatment for hæmoptysis (*q.v.*) is applicable in such cases. The recurrent bronchitis needs special care, because of the damaged state of the lung, and the likelihood of the attacks running on to a pneumonia, or becoming fœtid; otherwise their treatment does not differ from that of ordinary cases. The chief aim is to prevent the retention and decomposition of sputa, and correct the fœtid and septic nature of the secretions. The following points are important:—

Encourage the emptying of the dilated tubes, by mechanical means if natural efforts of coughing are ineffectual. This can be done by inverting the patient, getting him to assume the genu-pectoral position, or lean well over the edge of the bed so that his head nearly touches the floor. In children, emetics are often useful to help in the expulsion of the accumulated secretions, or firm rubbings and pressure of the chest with the hands. These methods are directed towards prevention of decomposition, but are equally important where fœtor is present. In such a case we must add the use of antiseptics. These may be given by the mouth, inhaled, or introduced by intratracheal injections, or they have even been injected directly into the cavity of the dilated tube through the chest wall with a hypodermic syringe.

Internally, the best remedy is creasote (2 to 3 min. given in capsule twice a day) or guaiacol (5 to 6 min. twice daily). Oil of garlic (1 to 2 min. in capsule twice a day) is also often very effectual.

For inhalations, the formulæ given below will be found useful. But by far the most successful way of getting the secretions sweet is by the inhalation of creasote, vaporized by heat. For this purpose the patient is put into a small chamber, rendered as air-tight as possible, and a metal dish full of ordinary commercial creasote is placed on a tripod under which a small spirit lamp is arranged. The vapour comes off in dense, whitish fumes. These fumes are very irritating, so that the eyes of the patient must be protected by watch-glasses and strapping, and his nostrils plugged with cotton-wool, whilst he is instructed to breathe through his mouth. Salivation, profuse coughing, and expectoration result; usually patients are not able to tolerate a sitting longer than from ten to twenty or twenty-five minutes, which should be repeated daily. We know of no more efficacious means of reducing the fœtor of the expectoration.

Intratracheal injections are usually composed of: menthol 10 per cent, guaiacol 2 per cent, olive oil 88 per cent, and about a drachm of this mixture is introduced, by means of a tube and syringe, into the trachea twice daily. Care must be taken, during the injection, that the patient is lying on the side into which it is wished that the remedy should go, in order that it may gravitate into that bronchus.

Lastly, it is necessary to mention that some very chronic bronchiectatic cavities have been treated by incision and drainage. The results are not encouraging. The cavity cannot contract and become obliterated, and thus a permanent sinus usually results. More recently, further operative measures have been used. Where there has been a single, more or less limited, dilatation of a tube, excision has been practised with success; and where the dilatation (and other damage to the lung) has been due to a foreign body, operation has been resorted to for its removal.

Inhalation for Fœtid Bronchitis.

℞ Acidi Carbolici ℥ss | Tincturæ Opii Camphoratæ ℥iij

One teaspoonful to be freely inhaled from half a pint of hot water. (*Davis.*)

Compound Iodoform Inhalation.

℞ Iodoformi gr. j | Chloroformi ♏ij
Olei Eucalypti ♏x | Spiritus Rectificati ♏x

10 to 15 drops to be inhaled from the sponge of a respirator.

(*Vict. Park Hosp. Pharm.*)

Creasote Inhalation.

℞ Creasoti | Alcohol Absoluti Partes Æquales

10 to 15 drops to be inhaled from the sponge of a respirator.

(*Vict. Park Hosp. Pharm.*)

W. J. Hadley.

BRONCHITIS, ACUTE.—Treatment should be directed to the relief of the congestion of the bronchial mucous membrane, to the increase of the secretion of the bronchial mucus, to the prevention of the spread of the inflammation to the finer bronchial tubes, to lessening the patient's discomfort, and to combating complications. The patient should be kept in one room, the temperature of which should be from 60° to 65° F.; the air may be moistened by a steam kettle, to the water in which may be added some aromatic such as oil of eucalyptus (5 min. to the pint), compound tincture of benzoin (1 drachm to the pint), or phenol (½ drachm to the pint). If the attack be severe, the patient should be confined to bed, propped up by pillows or a bed-rest; the clothing should be warm but light; a Shetland-wool jacket or one made of Gamgee tissue is useful for this purpose.

In the earlier stages the diet should be fluid and warm; later, solids may be added as the appetite returns. Stimulants may be given in small quantities if the patient is accustomed to them; otherwise they should be reserved until special indications for their use arise.

Hot baths, vapour baths, and Turkish baths are frequently employed at the onset of acute bronchitis; they promote diaphoresis and relieve the bronchial congestion, but great care has to be exercised to avoid a subsequent chill. The employment of drugs depends upon the stage of the disease and the condition of the patient. Before the

bronchial secretion is established, ipecacuanha, antimony, or aconite, combined with diaphoretics and purgatives, are useful :—

℞ Vini Ipecacuanhæ
Spiritus Ætheris Nitrosi āā ℥xx
Liquoris Ammonii Acetatis ℥ij
Aquæ Camphoræ q.s. ad ℥j
Every four hours.

Or,

℞ Pulveris Ipecacuanhæ gr. j
Potassii Nitratis gr. v
Ft. pulv. Every four hours.

Vinum antimoniale may be substituted for the vinum ipecacuhanæ in young adults. It is a very valuable drug in bronchitis, but its effect on the circulation should be observed. Aconite may be given if the pulse is full and bounding ; one minim of the tincture in a little water should be administered hourly for six or eight doses, the effect being carefully watched.

In the early stage, sleep may be secured and much relief given by pulv. ipecacuhanæ co. 10 gr., combined, if an aperient be required, with one or two grains of calomel, to be followed on the following morning by a dose of Apenta water or a seidlitz powder. At this stage stimulating applications to the chest relieve the sensation of soreness. Lin. terebinthinæ aceticum or lin. camphoræ co. may be employed, or portions of a mustard leaf may be applied to the chest. Poultices are seldom necessary, and may do harm from the weight and the difficulty of changing them without chilling the patient. If the cough at this stage is very troublesome, and is not controlled by demulcents such as barley-water, or liquorice or marsh mallow lozenges, inhalations may be of use :—

℞ Mentholis gr. xij
Chloroformi ℥j
Alcohol 90 % ℥j
20 min. in a pint of hot water for the inhalation.

In some cases, where there seems to be an asthmatic element with marked bronchial obstruction, relief may be given by belladonna or stramonium combined with iodide of potash :—

℞ Tincturæ Belladonnæ ℥x
Potassii Iodidi
Ammonii Carbonatis āā gr. iij
Potassii Bicarbonatis gr. xv
Aquæ Camphoræ q.s. ad ℥j
Three or four times daily.

Careful watch must be kept for toxic effects of the belladonna or iodide, which in some patients appear very early. In this type of case, where there is not much bronchial secretion, apomorphine may be of great use :—

℞ Syrupi Apomorphinæ Hydrochloratis (B.P.C.)
A teaspoonful every two hours until the bronchial secretion is established.

When the bronchial mucous membrane begins to secrete and sputum appears, stimulant expectorants should be prescribed :—

℞ Ammonii Carbonatis gr. iv
Vini Ipecacuanhæ ℥x
Tincturæ Scillæ ℥xv
Infusi Senegæ q.s. ad ℥j
Every four hours.

During convalescence general tonics and change of air are of great value.

It is best to avoid opium as much as possible ; sometimes it is of great value at the commencement of an attack when there is an irritating but useless cough which keeps the patient awake, and again at the end of an attack when the expectoration is free but persistent. In the former case pulv. ipecacuanhæ. co. is probably the best preparation, in the latter tinct. camphoræ co. :—

℞ Aceti Scillæ ℥xv
Tincturæ Camphoræ Co. ℥xxx
Spiritus Chloroformi ℥x
Infusi Cascarillæ q.s. ad ℥j
Thrice daily.

Opium is contra-indicated when there is any degree of cyanosis. Sleep is most important at all stages of the disease ; if it cannot be secured by simple measures such as hot

sponging, and hot fluid food with or without alcohol, recourse must be had to drugs. Paraldehyde is perhaps the safest, but is nauseous :—

℞ Paraldehydi	℥j	Spiritus Vini Rectificati	℥ij	
Glycerini	ℿxl	Aquæ Cinnamomi	q.s. ad	℥j

The draught to be taken at bedtime.

Sulphonal 20 to 30 gr., methylsulphonal 20 to 30 gr., barbitone 5 to 10 gr., in cachets, are safe but not always successful. If opium seems necessary, it is best given in the form of morphia ($\frac{1}{6}$ to $\frac{1}{4}$ gr.) hypodermically, in combination with atropine ($\frac{1}{60}$ to $\frac{1}{20}$ gr.).

The occurrence of cardiac failure must be met by the exhibition of appropriate remedies (*see* CONGESTION, PULMONARY). *Cecil Wall.*

BRONCHITIS, CHRONIC.—When bronchitis has become chronic, and is associated with emphysema, as is then almost invariably the case, treatment can be directed only towards the relief of symptoms and the prevention of the recurrent acute attacks which aggravate the condition.

Specific Treatment.—Active immunization of the patient by vaccines prepared from organisms isolated from the sputum has been practised in cases of chronic bronchitis. Satisfactory results have been recorded, especially from autogenous vaccines prepared from the sputum at the onset of an acute exacerbation. The use of vaccines is not unattended by danger ; they should be prescribed only by those who have had special experience, and the tentative employment of stock vaccines is most undesirable. They should not be given if there is any abnormality in the nose or throat requiring local treatment. (*See* SPECIFIC THERAPY.)

General and Preventive Treatment.—The etiology of the disease in each patient must be considered, and, so far as is possible, steps should be taken to remove the cause. If the patient's occupation be dusty, or if it involve frequent exposure to inclement weather, or otherwise seem deleterious, the possibility of a change should be considered ; if some other disease be the underlying cause, e.g., spasmodic asthma, rickets or adenoids (in children), fibrosis or tuberculosis of the lungs, heart disease, gout, obesity, chronic kidney disease, etc., appropriate treatment should be adopted. In all cases of chronic bronchitis, special attention should be paid to the condition of the nose. Gross abnormalities, such as polypi or a deviated septum, may aggravate, if they do not cause, the bronchitis, and minor abnormalities, by predisposing to recurrent coryza, frequently lead to exacerbations.

Patients with chronic bronchitis are much affected by sudden changes of temperature, and the details of their daily life should be arranged accordingly : the clothing should be warm yet light, conditions best fulfilled by flannel or Jaeger underclothing ; 'chest protectors' are cumbersome, difficult to keep clean, and unnecessary. A light shawl should be the constant companion of a lady in evening dress. The extremities, especially in children, should be warmly clad.

The living-rooms should be kept warm, but not too warm, lest the change of temperature on leaving them should exercise a bad effect ; efficient ventilation is most important ; the foul air of crowded assemblies, close railway carriages, and the like are frequent sources of danger. Those liable to bronchitis should be careful to avoid contact with those in the acute stage of coryza. To many patients a fire in the bedroom in the winter is a necessity rather than a luxury ; closed stoves, gas fires, and naked gas flames in the room generally prove harmful. Close confinement to the house as a routine measure is very much to be deprecated ; daily exercise in the open air with reasonable precautions to prevent chills is not merely the best means to prevent recurrent attacks of acute bronchitis, but also the safest guard against dyspepsia, obesity, and the other ills of a sedentary life. Careful attention to such details as these will add much to the comfort of a sufferer from chronic bronchitis.

To those who can afford it, the approach of winter will suggest migration to a warmer climate. Many places on the south coast of England, in the French or Italian Riviera, Sicily, Algiers, or Egypt have climatic advantages, but it must always be remembered that the majority of patients are unable to obtain the same care and comfort when travelling that they can enjoy at home. In selecting a winter resort, the individual should receive

at least as much attention as the bronchitis, and any associated conditions must be taken into careful consideration.

Drug Treatment.—The treatment of chronic bronchitis by drugs must be determined by symptoms and by associated conditions. If an attack of acute bronchitis supervenes, as is often the case, it should be treated as described under that heading.

When the cough is chronic and the sputa abundant and easily expectorated, the aim of the treatment should be to aid the expulsion of the secretion, to stimulate the respiratory centre, to strengthen the right ventricle, and, if necessary, to procure sleep. A nutritious diet, rich in fatty foodstuffs, is generally indicated; often it is desirable to supplement this with cod-liver oil or other easily digested fat, e.g. :—

℞ Extracti Malti cum Oleo Morrhuæ.
Two teaspoonfuls to be taken twice a day after meals.

Or one of the many proprietary preparations may be prescribed.

An old and useful prescription in an ordinary case of chronic bronchitis, with moderate secretion, is :—

℞	Tincturæ Nucis Vomicæ	♏v	Spiritus Chloroformi	♏x
	Ammonii Carbonatis	gr. v	Infusi Senegæ	q.s. ad ℥j
	Tincturæ Scillæ	♏xv		

Three or four times a day.

Senega is very useful, but unfortunately it is very nauseous; solutions containing it froth very readily, hence the bottle should not be shaken. Infusions of serpentary, cloves, or gentian may be substituted for the senega, but are not as efficient.

Nux vomica has been called the best hypnotic in chronic bronchitis; often it acts like a charm. In old people it sometimes causes great irritability of the bladder; in this case tincture of belladonna may be substituted for it in the above prescription. If the right ventricle shows signs of failure, the addition of tincture of 5 to 10 min. digitalis to the mixture is advisable. Squill is a very valuable stimulant expectorant, and also aids the action of the heart in the same way as digitalis. Another useful and palatable cough mixture is :—

℞	Syrupi Scillæ		Aquæ Chloroformi	q.s. ad ℥j
	Acidi Hydrobromici diluti	āā ℥ss		

Three times daily.

Or,

℞	Oxymellis Scillæ	℥ss	Aquæ Anisi	q.s. ad ℥j
	Vini Ipecacuanhæ	♏x		

Three or four times daily.

When the sputum is scanty and tenacious, potassium iodide is of great value :—

℞	Potassii Iodidi	gr. iij	Potassii Bicarbonatis	gr. x
	Ammonii Carbonatis	gr. iv	Aquæ Camphoræ	q.s. ad ℥j

Three times a day after meals.

When there is an asthmatic element, belladonna or stramonium should be added to the mixture :—

℞	Potassii Iodidi	gr. iij	Tincturæ Stramonii	♏v
	Ammonii Carbonatis	gr. iv	Extracti Glycyrrhizæ Liquidi	♏xx
	Potassii Bicarbonatis	gr. xv	Aquæ	q.s. ad ℥j

Thrice daily.

Treatment of Cough.—Cough is the symptom of which the patient will complain most; generally speaking it is useful, serving to keep the bronchial tubes empty of secretion. In such circumstances the cough should be encouraged, though steps may be taken to relieve the more distressing features; in most cases it is sufficient to prescribe some simple lozenge or linctus to be used in conjunction with the general treatment outlined above. The trochiscus glycyrrhizæ of the Brompton Hospital is well known :—

℞	Extracti Glycyrrhizæ	gr. iij	Trochisci Acaciæ	gr. x
	Olei Anisi	♏ss		

A lozenge to be taken occasionally.

Or the trochiscus kino eucalypti of the B.P. may be employed, with or without the addition of menthol $\frac{1}{4}$ gr. Many similar lozenges may be obtained. The most serviceable linctus is :—

℞ Tincturæ Camphoræ Co. | Syrupi Tolutani āā ℥xx
Oxymellis Scillæ |

One teaspoonful occasionally.

Another simple linctus is :—

℞ Syrupi Scillæ | Syrupi Papaveris
Syrupi Limonis | Syrupi Tolutani āā ℥xv

One teaspoonful occasionally.

For the morning cough a hot alkaline drink taken before rising in the morning is often of extreme value, e.g., the following mixture with an equal quantity of hot milk or water :—

℞ Sodii Bicarbonatis gr. xv | Spiritus Chloroformi ℥v
Sodii Chloridi gr. v | Aquæ Anisi q.s. ad ℥j

If, on the other hand, the cough be useless and harassing, it may be wise to use more sedative remedies, especially when sleep is disturbed :—

℞ Liq. Morphinæ Hydrochloridi ℥vj | Spiritus Chloroformi ℥iv
Aquæ Laurocerasi ℥viij | Syrupi Limonis ℥xxx
Glycerini q.s. ad ℥j

Occasionally.

Or,

℞ Heroini Hydrochloridi gr. $\frac{1}{8}$ | Tincturæ Pruni Virginianæ ℥x
Terpini Hydratis (P.G.) gr. j | Glycerini ad ℥j

Occasionally.

For a troublesome, ineffectual night cough :—

℞ Pilulæ Ipecacuanhæ c. Scilla gr. iv

The pill to be taken at bedtime.

Or,

℞ Morphinæ Hydrochloridi gr. $\frac{1}{3}$ | Pilulæ Aloes et Myrrhæ gr. ij
Atropinæ Sulphatis gr. $\frac{1}{30}$ |

The pill to be taken at bedtime.

A long-continued, distressing, ineffectual cough is often much relieved by ammonium chloride. It may be prescribed in the form of a lozenge containing :—

℞ Ammonii Chloridi | Extracti Glycyrrhizæ āā gr. iij

Or a fruit basis may be substituted for the liquorice. If a solution be preferred :—

℞ Ammonii Chloridi gr. xv | Spiritus Chloroformi ℥x
Tincturæ Limonis ℥j | Aquæ q.s. ad ℥iij

To be sipped frequently.

Inhalation of the mixed vapours of hydrochloric acid and ammonia is a common mode of administration of the drug. Several forms of apparatus suitable for the purpose can be obtained. Steam inhalations often prove of great value ; water at a temperature of 140° should be used in a special apparatus, and any of the following may be added to each pint :—

℞ Tincturæ Benzoinæ Compositæ ℥j

Or,

℞ Olei Eucalypti | Tincturæ Benzoinæ Co. āā ℥xx
Olei Pini Sylvestris |

Or,

℞ Mentholis gr. ij | Spiritus Coloniensis q.s. ad ℥j
Chloroformi ℥x |

Insomnia.—The sleeplessness of chronic bronchitis often disappears under general treatment, without special hypnotics. In a very bad attack it is necessary for the patient to keep awake in order by voluntary effort to assist the exhausted respiratory centre.

If strychnine (probably the best hypnotic in chronic bronchitis), digitalis, carbonate of ammonia, and belladonna have failed to induce sleep, recourse must be had to other drugs.

Alcohol.—The best brandy or whisky obtainable should be used. Many of the cheaper spirits given in large doses are poisonous. The great advantage of brandy or whisky as a hypnotic is that it is quickly eliminated, and it is not cumulative in its action. Starting with small doses, ½ to 1 oz., about an hour before the time at which the patient usually goes to sleep, the quantity may be gradually increased. Its effect varies much in different patients, and it is only by trial that its value can be estimated.

If it (*a*) Produces sleep, and lessens restlessness; (*b*) Lessens frequency of respirations; (*c*) Lessens frequency of pulse; (*d*) Lowers temperature; (*e*) Makes the tongue less dry—it may be safely continued.

At present, for many reasons, the tide is running strongly against the use of alcohol; but in suitable cases it is, beyond doubt, valuable and effective.

The Bromides.—These must be used in full doses to have any chance of success.

℞ Sodii Bromidi		Tincturæ Hyoscyami	℥xx
Ammonii Bromidi	āā gr. xx	Aquæ Camphoræ	q.s. ad ℥j

If this draught fail within one and a half hours, it should be repeated. Some such combination, which can be varied in many ways, is safe, and often answers.

Paraldehyde, in doses of 1 to 2 drachms, induces quiet sleep, and has very few unpleasant after-effects, but its taste and smell are intolerable to many patients. The adjuvants usually added do not get rid of this disadvantage entirely. Two formulæ are:—

℞ Paraldehydi	℥j	Extracti Glycyrrhizæ Liquidi	℥iss
Syrupi Aurantii	℥xv	Aquæ	q.s. ad ℥j

M. Ft. haustus.

Or,

℞ Paraldehydi	℥j	Extracti Glycyrrhizæ Liquidi	℥j
Olei Amygdalæ Ess. (sine Acido Hydrocyanico)	℥iss	Syrupi	℥ss
		Aquæ	q.s. ad ℥ij

M. Ft. haustus. (*Martindale.*)

Sulphonal 20 to 30 gr., methylsulphonal 20 to 30 gr., barbitone 3 to 7 gr., in tablets or cachets, are worth trying.

Opium.—The well-recognized disadvantages of opium or morphia in chronic bronchitis are that while, with very few exceptions, they may be relied on to produce sleep, (*a*) They are cumulative, and not easily eliminated; (*b*) They depress and lull the respiratory centre at a time when its activity is most essential; (*c*) They upset the digestive process. These dangers are real, but may be much exaggerated, and should not paralyze the practitioner in face of persistent insomnia. A few hours' steady sleep is often the turning-point in a bad case of bronchitis.

The simplest combination, the old-fashioned pulvis ipecacuanhæ co., may be given in doses of 5 to 15 gr., with or without some alcohol.

Morphia may be given hypodermically, guarded by small doses of atropine, which lessen the effect on the respiratory centre.

℞ Morphinæ Hydrochloridi	gr. ¼–⅓	Atropinæ Sulphatis	gr. $\frac{1}{120}$

Ft. injectio hypodermica.

One rarely sees any trouble from these doses. The atropine, besides its effect on the respiratory centre, diminishes the tendency to sweating. There are cases when everything fails, but in the majority, with care, safe sleep may be induced.

Cardiac Failure.—The most frequent and dangerous complication of chronic bronchitis is cardiac failure; œdema and congestion of the lungs are superadded to the bronchitis, and demand special treatment. (*See* CONGESTION, PULMONARY, and ŒDEMA.)

Cecil Wall.

BRONCHOPNEUMONIA, CATARRHAL.—(*See also* BRONCHITIS, *and* PNEUMONIA.) With the differential diagnosis between this affection and the croupous form we shall not deal.

It is, however, necessary to emphasize the following points :—

1. That catarrhal pneumonia is associated almost invariably with—practically is an extension from—bronchitis.

2. There is usually as much disseminated collapse as there is patchy consolidation of lung.

3. It is seen frequently in connection with diseases characterized by pulmonary catarrh, such as measles, pertussis, etc., and also in debilitated, rachitic, and unhealthy children.

4. It is more often followed by imperfect resolution, resulting in permanent damage to the lung.

As regards treatment, it must be remembered that, the affection being as it were a combination of bronchitis and pneumonia, with collapse, many of the methods applicable in these two conditions are frequently useful here. It may be impossible to say where bronchitis ends and pneumonia begins, and the treatment is simply that of acute bronchitis ; whilst in other cases, the usually discrete, consolidated areas spread and coalesce until the condition is one of extensive pneumonia, complicated by a more or less diffuse bronchitis. We will, however, take an ordinary case. The indications for treatment will be :—

1. To relieve the evident difficulty of breathing, by liquefying and expelling the tenacious bronchial secretion ; that is, treating the bronchitis.

2. To prevent extension of pneumonia and collapse.

3. To support the general strength and cardiac action.

1. *To Remove Secretion.*—In adults, expectorants, such as the carbonate and chloride of ammonium, squills, copious hot alkaline drinks, or the inhalation of steam, are most useful. In children, steam inhalation will be most reliable, or better still, getting them to take frequently-repeated drinks of milk and lime-water, weak broth, or some other liquid, but always HOT. In their case it is generally necessary to cause vomiting in order to get a proper emptying of the bronchial tubes : 10 to 20 gr. of powdered ipecacuanha (or 1 drachm of the tincture) may be used from time to time ; its depressing effect must be carefully watched, and it cannot often be repeated. Cupric sulphate is a very reliable and rapid emetic, without the depressing effect of ipecacuanha on the heart. In all cases it must be remembered that expectoration, vomiting, or absorption must get rid of secretion as fast as it is made, or the tubes will become more and more blocked, with all that that means in dyspnœa, cyanosis, etc. It is useless, and even harmful, to promote a copious, watery secretion, without the patient having the power, or being stimulated, to get rid of it. There is not the necessity, so marked in the croupous form, for avoiding unnecessary movement; and, especially in children, frequent examinations of the chest, changes of position, brisk rubbing and squeezing of the chest wall, are most helpful means of stimulating expectoration.

N.B.—It must be distinctly understood that steam inhalation is recommended only when the secretion is scanty, is never to be used continuously in the old-fashioned way, and must always be discontinued when the secretions increase or if the slightest cyanosis is noticed.

2. *To Limit Extension of Consolidation and Collapse.*—Active local measures, such as leeching, cupping, etc., often so useful in the croupous form, are not attended by such good results in these cases. In the majority all that is necessary is to keep the patient very warm by applying a cotton-wool jacket. Where the signs in the lungs are widespread, accompanied by great dyspnœa, retraction of ribs, and cyanosis, active interference is necessary. Collapse goes hand in hand with consolidation in such cases ; the symptoms (dyspnœa, etc.) are due as much to one as to the other, and our treatment must be directed to opening up collapsed air-cells quite as much as to preventing a few more small areas of consolidation. Application of cold to the chest has been recommended for this purpose, and may take the form of ice cloths, ice packs, cold bath, or douching. It has the twofold effect of lowering temperature and causing deeper respiratory movements calculated to inflate collapsed areas. Such methods are often attended by rapid and most beneficial results. It must, however, be laid down most strongly that such treatment is not

unattended by risk of general collapse and heart failure, the patient becoming pallid and cold, with a small pulse. The good effects are seen in lowered temperature, deeper and easier breathing, and improving colour (less cyanosis). We think even better results are seen from an almost opposite line of treatment, viz., the hot mustard bath, accompanied by vigorous rubbing and squeezing of the chest while the child is in it. The water should be as hot as can be borne by the nurse's hand, and a good tablespoonful of mustard added; the child should be immersed to the shoulders for one to three minutes, vigorously rubbed, rapidly dried, and again covered in cotton-wool and blanket; the whole thing to be done before a good fire. Usually the respirations are much easier and deeper, and this effect can be increased by dashing cold water on the face and neck while the child is in the hot bath.

3. *To Maintain Strength and Cardiac Action.*—The fever is not so high, nor is the toxæmia so great, as in the croupous form, and the imminent danger of cardiac failure in *that* form is replaced in this by a failure of respiration, begotten of choked bronchial tubes and collapsed lung; though of course such a condition tends to cause cardiac failure eventually.

For the maintenance of the general strength food is of the greatest importance; it should be given frequently in liquid form, in small quantities, and is better given hot so as to stimulate secretion.

As a stimulant we prefer strychnine, because of its action on the respiratory centre as well as on the heart. Oxygen is rarely of much use, as it cannot get beyond the choked tubes. Digitalis is often helpful, as are also ether and caffeine. The same remark must be made as in speaking of stimulating drugs in croupous pneumonia, that in many cases to do any good at all they must be given under the skin.

Alcoholic stimulants are sometimes needed, and when used should be given in hot milk and water (10 to 20 drops every three hours will be enough for an infant). In some cases, where there is gastric intolerance, it is better to give stimulant and nourishment by the bowel for a time.

The after-treatment in bronchopneumonia is, without doubt, of far greater importance than in the croupous form. The collapsed and inflamed condition of the lungs, and the frequently unhealthy and generally debilitated state of the little patients, cause resolution to be slow and often imperfect; and one sees more permanently damaged, fibroid, and contracted lungs as the result of bronchopneumonia than from any other cause. In adults the risk of the supervention of pulmonary tubercle must be borne in mind. It is therefore important, in order to obtain as full and early a recovery of the lungs as may be, to get such cases into absolutely pure air as soon as possible, and to teach them systematic gymnastic and deep-breathing exercises. General tonic treatment, with abundance of good food, is also important.

Respiratory Stimulant in Bronchopneumonia.

℞	Strychninæ	gr. $\frac{1}{4}$	Extracti Cinchonæ Liquidi	ʒiij
	Acidi Hydrochlorici Diluti	ʒj	Aquæ	q.s. ad ʒiv
	Spiritus Chloroformi	ʒss		

M. Fiat mistura. For a child five years old, ʒj (= $\frac{1}{120}$ gr. strych.) in water every three or four hours (*Burney Yeo*).

Stimulating Expectorant.

℞	Ammonii Carbonatis	gr. j	Glycerini	℥x
	Vini Ipecacuanhæ	℥iiss	Aquam	ad ʒj

M. Fiat mistura. One teaspoonful three or four times a day for a child under ten years. *W. J. Hadley.*

BRONCHOSCOPY.—(*See* Foreign Bodies in the Air-passages or Œsophagus.)

BUNION.— *See* Hallux Valgus.)

BURNS AND SCALDS.—The treatment is both general and local.

General Treatment.—The first aim in the general treatment of burns, except in those of a trivial character, is to deal promptly and thoroughly with shock, which is usually the most important general symptom. This should be done before any attempt is made to

remove charred clothes or to examine the burn. Where the shock is severe, the pain may be comparatively slight, and vice versa. Should the pain be unbearable, it may be advisable in the first instance to give a hypodermic of morphia ; but this should not be resorted to without due consideration, as when its influence wears off the excitability of the patient may be increased by it, and it should not be given to children unless the burn has been so extensive as to render recovery improbable. Stimulants, such as brandy, strychnine, etc., should not be prescribed, as they do more harm than good and are liable to irritate the exhausted brain centres. The best method of combating shock is by immersing the patient immediately in a hot bath, kept at an even temperature of about 95° by the addition of hot water from time to time. By this means the patient is soothed and quieted, and the clothes are sufficiently softened to be removed without inflicting pain. The shock should then be counteracted by infusions of normal saline solution (1 teaspoonful of common salt to 1 pint of water) either per rectum (10 to 15 pints at 105°), subcutaneously (3 pints being injected beneath the scapula), or, preferably, intravenously into the median basilic vein, about 1 pint being injected slowly from a receiver. The intravenous injection can be made more effective by the addition of 30 minims of the liquor adreninæ hydrochloricus or by the intramuscular injection of 1 c.c. of a 20 per cent solution of pituitary extract. The patient should be kept in the bath till he has quieted down sufficiently to be removed to a warmed bed. If the pulse is still feeble, the foot of the bed should be raised two feet higher than the head, and the blood-pressure increased, where the abdomen has not been burned, by a many-tailed bandage applied around it. When recovery occurs, small quantities of hot water and, later, of hot milk may be given.

After the stage of shock has passed, secondary effects may develop, such as toxæmia, inflammatory diseases of internal organs, and later, after the separation of the eschar, septicæmia from an invasion of the blood and tissues by pus-cocci. These should be dealt with on general surgical principles.

In the case of burns occurring in the open, as in troops in the field, in view of the possibility of contamination with the tetanus bacillus, it is advisable as early as possible to give a prophylactic injection of 1000 units of antitetanic serum.

Local Treatment.—The local treatment may be described most conveniently under the headings of the different degrees of burns. The aims in the local treatment are briefly as follows : (1) To prevent sepsis ; (2) To avoid giving pain by frequent dressings ; (3) To employ methods which favour the removal of the eschar and promote re-growth of the epidermis ; (4) To reduce cicatrization so that a pliant scar is left ; (5) To prevent contracture and deformity.

Time-honoured greasy applications, such as carron oil and carbolic oil, should be avoided, as they increase the discomfort, the former encouraging sepsis and the latter being liable to be absorbed and to cause toxic symptoms.

Burns of the First Degree.—Where the skin is simply scorched, all that is necessary is to relieve the burning sensation by dressings moist with lead lotion, sodium bicarbonate solution (1 tablespoonful to 1 pint of water), or a 1 per cent aqueous solution of aluminium acetate. After this is accomplished a dusting powder should be applied and the part covered with cotton-wool and bandaged to avoid friction.

Burns of the Second Degree.—Here the most important consideration is the proper treatment of the vesicles and bullæ. On the whole it is best to open blisters, with proper antiseptic precautions, at the earliest opportunity, the cuticle being left as a protective covering. The burned area should then be dressed with gauze or lint soaked in a 1 per cent aqueous solution of aluminium acetate or picric acid, or a 2 per cent solution of ichthyol, the gauze being covered with sterilized cotton-wool and retained in position by a bandage or, in the case of the face, by a lint mask. The burned part should be placed in a position of rest, in the case of the arm or wrist by the use of a splint and sling, and in the leg by keeping it in a horizontal position. The dressings should be left untouched as long as possible, and only removed should the blistered area become septic. If the dressing has to be removed, it should be soaked off patiently with warm boric lotion and never forcibly pulled away, and should pus have collected beneath the cuticle this should be cleaned by gentle irrigation with the lotion. After the surface is cleansed, the moist dressing of aluminium acetate, etc., should be re-applied. In burns of this degree

complete restoration of the tissue usually takes place in about a fortnight, unless where the denuded surface has become septic and ulceration has occurred, when scarring may follow.

Burns of the Third and Fourth Degrees.—The treatment of burns of this severity may be divided into: (1) Immediate treatment up to the separation of the eschar; (2) Healing of the granulating surface.

Treatment up to the Separation of the Eschar.—When the shock has been overcome and the patient put to bed, any charred clothes which may still remain should be soaked off and tags of epidermis and loose tissue removed. The burned parts should be cleansed by irrigation with warm boric lotion, or in the case of the arms or feet by immersion in a bath containing boric lotion or warm saline solution. The burn should then be dressed with aluminium acetate lotion and the dressing retained by a loose bandage. The dressing should be removed only if sepsis occurs or if the parts become painful, in which case immersion of the affected part for several hours or days in a warm saline bath will give relief.

About the fourteenth day, when the eschar is ready to slough, it is advisable to remove the dressings occasionally and to irrigate the sloughing surface with boric lotion.

Healing of the Granulating Surface.—After the separation of the eschar, an ulcerated surface is left covered with moist red granulations. Occasionally, the separation is associated with hæmorrhage, which can be controlled generally by hæmostatics, but in rare instances may necessitate ligature of a larger vessel.

The best method of treating the granulating surface is what is known as the '*open method*', in which healing is allowed to take place under a natural scab. In it no dressings are employed, but the raw surface is simply exposed to the air and powdered over with a bland aseptic powder which cakes up with the discharge to form a crust. This treatment is particularly applicable in the case of the leg, where the procedure is as follows: A mackintosh sheet is placed under the leg, and over it a long pad of cotton-wool covered by gauze on which the leg rests; over the leg is placed a cradle to keep off the bedclothes, and an electric lamp may be suspended from the top of the cradle to afford heat. Should the burn be on the flexor aspects of the leg, it is necessary to sling the limb from the cradle by gauze bands. In the case of the arm a protective wire cage should be devised to keep off the clothes.

After the limb is in position the granulating surface should be dredged over freely with an aseptic dusting powder, such as magnesium carbonate or stearate of zinc. By the addition of more powder from time to time, the crust is slowly increased in thickness till it becomes a coarse, uneven, yellowish-green scab. At the edges of the scab sero-pus generally oozes out and trickles down on to the gauze, and should this discharge be excessive, or should general septic symptoms supervene from absorption, it may be necessary to remove a small portion of the crust and irrigate the surface with boric lotion, or to immerse the limb completely in a boric bath. Once formed, the scab should be touched as seldom as possible, and left until it dries up, crumbles, and separates naturally. To minimize the odour from the discharge a small vessel containing Condy's fluid may be placed in the cradle.

By this method constant re-dressing is avoided, there is no interference with the new-growing epidermis, the pressure of the scab restrains exuberant granulation, the discharge bathes the delicate nerve-endings and soothes pain, and the resultant scar is pliant and shows comparatively little tendency to contract.*

Healing may be obtained also by the formation of an artificial scab in what is known as the *paraffin treatment.* The first paraffin preparation to be employed was known as ambrine, and was a French patent preparation containing paraffin, wax, and resin. Somewhat similar preparations have been put on the market since by British firms. The paraffin is melted and sprayed on to the skin by a special apparatus, or painted on with a soft brush, and allowed to solidify to form a waxy scab or cast under which healing takes place. To thicken the cast, a piece of clean tissue-paper or a layer of cotton-wool may be laid over the first coating, and this, in turn, covered with paraffin.

---

* For a full description of the open method of treatment of burns see *Burns and their Treatment*, by J. M. H. MacLeod. Oxford University Press, 1918.

The burn is re-dressed every twenty-four hours, the waxy case peeling off easily owing to the underlying exudation.

This treatment promotes rapid healing with comparatively little scarring, but it has no advantage over the 'open method', and has the disadvantages of being somewhat troublesome to do and having to be repeated daily.*

Grafting.—Where the granulating surfaces of a burn are so large and deep that no islands of epidermis are left, it may be advisable to resort early to grafting. Thiersch grafting is rarely satisfactory, but good results may be obtained from linear grafts threaded among the granulations or from deep grafts cut down as far as the subcutaneous tissue, taken from the abdomen, buttocks, or whatever situation is convenient, and placed over the wound, the base of the flap being left uncut for the first ten days to enable the circulation to be maintained.

Burns of the Fifth and Sixth Degrees.—In these, amputation of completely charred parts may be necessary, but otherwise the treatment is similar to that for burns of the third and fourth degrees.

REGIONAL BURNS.

Eye.—Any foreign body, such as particles of molten metal or grit, which may have lodged about the eyeball or the conjunctival sac, should be removed by cotton-wool or forceps, the sac freely irrigated with boric lotion, and a cold boric compress applied. If there is much pain, a few drops of a 2 per cent solution of cocaine should be instilled, and if much congestion a few drops of 1–1000 solution of adrenalin. Adhesions should be broken down, and the eye washed out regularly with boric lotion. To relieve ectropion, plastic operations may be necessary.

Mouth and Throat.—In scalds of the mouth, of even a mild degree, the swelling and soreness may be so great as to prevent swallowing, and there is a danger of œdema of the glottis, which may necessitate intubation or tracheotomy. The patient is usually highly excitable, and in such pain that a hypodermic of morphia may be advisable, and an intravenous infusion of normal saline solution to counteract collapse. Swallowing may be so painful that it may be necessary to administer food in the form of nutrient enemata. Where the œsophagus has been scalded, and healing has set in, soft bougies should be insinuated gently in order to prevent constriction; where serious constrictions have taken place, swallowing may be impossible and a gastrostomy be necessary.

PREVENTION AND TREATMENT OF HYPERTROPHIC SCARRING AND DEFORMITY.

The treatment of the unsightly deformities from burn scars is so unsatisfactory that every effort should be made towards their prevention. It is important that healing should be rapid, that the tissues should be irritated as little as possible, and that adjacent surfaces should be separated to avoid adhesions. It is essential that the parts should be put in proper position during healing; the leg should be kept extended and the ankle at right angles to the foot; in burns of the axilla the arm should be abducted to prevent a bat's-wing deformity; in burns of the arm or hand, the elbow, wrist, or fingers should be extended; and in burns of the side of the neck the head should be kept with the chin up. These positions should be maintained by suitably moulded poroplastic or plaster-of-Paris and gauze splints.

Hypertrophic scars may be reduced to some extent by radium and *x* rays, provided the treatment is begun as early as possible during the first six months.

J. M. H. MacLeod.

BURSÆ, AFFECTIONS OF.—Bursæ are sacs developed to minimize the effects of pressure and friction. Some are anatomically constant; others develop in response to pathological conditions—e.g., hallux valgus, gibbus in caries of the spine—and are called false or adventitious bursæ. As a rule, these latter do not show the unilocular character of an ordinary bursa.

---

* "Treatment of Burns by Paraffin", by A. J. Hull, *Brit. Med. Jour.*, 1917, i, 37; *Ibid.*, 1917, ii, 788.

INJURIES OF BURSÆ.

These are common, and may be either: (1) *Bruises*; or (2) *Penetrating wounds.*

1. **Bruises.**—These are more common in a bursa which was previously enlarged. Absorption of the hæmatoma may be very slow, the inner wall of the bursa being lined by endothelium. Under the bursa there may be some fracture of a bony prominence. It is rare for the clot to be completely absorbed, a fibrous thickening of the wall of the bursa being a common sequel. Finally, the hæmatoma may suppurate.

Treatment.—*a.* A radiograph should be taken—especially in a hæmatoma of the bursa over the olecranon, to exclude fracture of the ulna.

b. If there is the slightest abrasion of the skin, it must be cleaned thoroughly and protected from infection.

c. For the first twenty-four hours apply cold, either an ice-bag or an evaporating lotion.

d. Aid absorption of the clot by firm pressure, either by strapping or bandaging firmly over wool. Remember that if the elbow be bandaged, it must be bandaged in a flexed position. The arm must be put at rest in a sling, and massage will aid the absorption.

e. If the constitutional symptoms, and œdema over the swelling, point to suppuration, the hæmatoma must be incised and drained.

2. **Penetrating Wounds.**

Treatment.—The wound must be thoroughly cleaned, painted internally and externally with either tinct. iodi mitis or a 2 per cent solution of iodine in rectified spirit, any dirt or foreign material be removed, an aseptic dressing applied, and the part kept elevated and at complete rest. If suppuration takes place, there is danger of the underlying bone becoming infected; or, secondly, of the discharge of pus being followed by a serous discharge from the wall of the sac. The only treatment for this latter is excision of the bursa.

INFLAMMATION OF BURSÆ.

This is either (1) *Acute*; or (2) *Chronic.*

1. **Acute.**—This may be due to injury or sepsis, the sepsis gaining an entry from a penetrating wound, or being conveyed to the bursa by the lymphatic or blood system.

Treatment.—If we are certain that the exudation is serous, the part must be put at rest on a splint and elevated, and either cold applications to reduce the inflammation, or fomentations to ease the pain, must be applied locally. If pus be suspected or diagnosed, the bursa should at once be opened by free incision, the part fixed on a splint, and hot fomentations applied. Should the infection, say of an olecranon or prepatellar bursa, have come from a septic place on the hand or foot, the primary sore must be dealt with at the same time.

2. **Chronic.**—This is due to either: (*a*) Trauma; (*b*) Tubercle; or (*c*) Syphilis.

a. Traumatic Chronic Bursitis.—The most familiar examples are housemaid's knee and miner's elbow. Treatment is necessary if:—

i. The enlargement is disabling.

ii. The patient complains of weakness or aching in association with a deep-seated bursa.

iii. There is any evidence of pressure on nerves—e.g., the psoas bursa on the anterior crural nerve, or the bicipital bursa on the median.

Treatment.—If the swelling be a recent development, it may subside with rest and change of occupation—i.e., removal of the cause of irritation—counter-irritation in the form of a blister, or repeated painting with iodine. This treatment is tedious, and is apt to fail. Aspiration and injection of the sac with carbolic (1–20) or tinct. iodi mitis may be tried, but is also apt to fail. The best treatment for bursitis of any standing is entire extirpation of the sac. The incision must be planned so that the patient does not press on the scar in his occupation afterwards, and should not be directly over the bursa, as the skin is apt to be thin or adherent. The operation must be done with every precaution against sepsis, the danger being infection of an underlying bone or joint. Should any part of the sac be so adherent as to defy removal, it should be scraped with a sharp spoon and painted with pure carbolic.

b. Tuberculous Bursitis.—This may be due to spread of infection from the under-

lying bone, or it may be primary. The condition is suspected in a chronic bursitis for which no explanation is forthcoming in the way of trauma, and which comes on in a young person free from syphilis.

Treatment.—The ordinary constitutional treatment for tubercle—open air, sunshine, cod-liver oil, and tuberculin—must be faithfully carried out. The underlying bone or joint must be *x*-rayed, for the best treatment of a secondarily-infected bursa is to treat the primary bony lesion. If the bursitis be primary, then the bursa must be completely excised. A tedious and difficult operation; but the complaint is also a tedious one, and the scraping of sinuses and the opening and draining of abscesses is useless in the production of a cure. The condition is most commonly seen in one of the bursæ under the gluteus maximus in the region of the great trochanter, and the dissection is tedious, but necessary.

c. Syphilitic Bursitis.—Bursæ may become inflamed during the secondary stage; but the condition is obvious, and the treatment curative. A tertiary syphilitic bursitis is more common in the prepatellar bursa than in any other site.

Treatment.—Potassium iodide and mercury must be given; but there are cases in which the mass of fibrous tissue seems to resist the effect of iodide, and the only treatment is excision.

AFFECTIONS OF CERTAIN SPECIAL BURSÆ.

Subdeltoid Bursa.—Soon after the onset the elbow must be carried in a sling, kept at rest, and counter-irritation in the form of a blister or iodine applied over the point of the shoulder. Massage and passive movements should be commenced as soon as possible, for if the bursa become obliterated by adhesions, the result may be limitation of movement at the shoulder-joint. Should the effusion persist, the bursa must be excised by partial detachment of the deltoid from its origin. Should adhesions limit the movement of the shoulder, good results follow manipulation under an anæsthetic, with prompt massage and movement.

Bursæ in the Region of the Hip.—1. The bursa over the ischial tuberosity, when enlarged, is the cause of 'weaver's bottom'; its removal is tedious, and may involve a long dissection; but it is the only sure method of cure.

2. The bursa under the iliopsoas commonly communicates with the hip-joint when the former is found diseased. Its removal is very difficult, and endangers the nerve and vessels. In one case, the only thing I could do was to insert silk threads from the lumen of the bursa into the subcutaneous tissue, so as to form a permanent drain for the chronic enlargement of the bursa. In that one case the treatment was successful.

3. The bursa round the trochanter. This is a favourite site for tuberculous infection of the bursa. It is very apt to be mistaken for a tuberculous hip, or a tuberculous trochanter, although indeed the latter may actually be present.

Bursæ around the Knee-joint.—1. 'Parson's knee' is a chronic enlargement of the bursa over the tibial tubercle and the lower part of the ligamentum patellæ. The treatment is change of occupation, or excision.

2. At the back of the knee-joint there are six bursæ. The one that is most commonly enlarged is that between the semimembranosus and the inner condyle of the femur and the inner head of the gastrocnemius. It forms, when distended, a rounded swelling in the popliteal space. The treatment for this enlargement is a back splint, a bandage over wool, and painting with iodine. It may take eight to ten weeks to disappear, and the treatment therefore is tedious. Excision is more rapid and more certain; but the bursa itself at times communicates with the knee-joint.

Bursa between the Tendo Achillis and the posterior surface of the Os Calcis.—When inflamed it gives rise to considerable disability, which must be treated by rest and counter-irritation.

Robert Milne

CAISSON DISEASE (Compressed-air Illness).—In the iron caissons employed in subaqueous and tunnelling excavations, the workmen are exposed to atmospheric pressures two to three and a half times greater than that of the ordinary atmosphere. That they may be able to work at these pressures, the men in passing into the caisson are subjected to gradual increments of pressure in the adjoining air-lock. They undergo what

is known as ' compression '. Men who are beginning work for the first time often experience severe pain in the ears during compression, and become giddy. As these symptoms are due to excessive pressure upon the membrana tympani they are averted by the workmen swallowing air and allowing it to pass up the Eustachian tube. After finishing work, the men, before returning to the outside, undergo in the air-lock ' decompression '. It is after emerging from the air-lock that the typical symptoms of caisson disease arise, viz., severe pains in the muscles of the limbs and trunk, known as ' bends ', also paralysis of the lower extremities and of the bladder, requiring the use of the catheter. Other minor symptoms, such as headache, vomiting, epistaxis, hæmoptysis, and restlessness, usually disappear with rest in bed. For the muscular pains, a hypodermic injection of morphia is often required. Since the more serious symptoms depend upon the sudden disengagement in the blood and tissues of the nitrogen which has been inhaled in the atmospheric air, or, in other words, upon frothing of the blood owing to a rapid fall of pressure, experience has shown that the most successful treatment is to place the men back again in the air-lock, to compress them slowly, and then very gradually to decompress them. Plenty of time should be spent in the act of decompression—five minutes to each atmosphere being a fair average. Decompression by stages, i.e., rapid decompression from a high to a lower pressure and then stoppage for a few minutes, followed by a series of further reductions and stoppages, has been recommended ; but a larger experience is required to show its superiority over slow and gradual decompression. *Thomas Oliver.*

CALCULUS.—(See also Uric Acid Gravel.)

VESICAL CALCULUS.

In many cases the detection of a stone in the bladder presents no difficulties ; in others the diagnosis may be by no means easy. The sound will generally enable the practitioner to ascertain the presence of a calculus, but occasionally it fails. This may be due to the small size of the calculus ; to the presence of a very large intravesical projection of the prostate, the stone or stones lying in a deep post-prostatic pouch out of the reach of the sound ; or to the fact that the stone lies in a sacculus which only communicates with the bladder by a small opening.

X-ray examination is reliable except in the case of certain small stones, particularly those which consist entirely of uric acid. Cystoscopy is the most certain method in skilled hands, but even experts have been known to overlook a calculus when they relied on the cystoscope alone.

Finally, a valuable method in doubtful cases is suction with the litholapaxy evacuator. If the calculi are very small, they may be washed out, and give unmistakable proof of their presence by appearing in the bottle ; but if too large to enter the eye of the cannula, they will strike against it with the characteristic click.

In children, a vesical calculus can often be felt on combined rectal and abdominal examination.

Treatment.—The operative treatment of vesical calculus has been revolutionized by the gradual perfecting of lithotrity with the removal of the fragments at one sitting, to which the name of litholapaxy is now applied. The death-rate is very low when improper cases are excluded and the operation is placed in skilled hands. The following table from the reports of St. Peter's Hospital, London, will show the marked improvement which has resulted :—

Decade	Operated upon by Litholapaxy	Death-rate
1864–73	118	15·25 per cent
1874–83	196	15·30 ,,
1884–93	362	8·29 ,,
1894–1903	600	4·83 ,,
1904–1913	578	3·28 ,,
1914–1919	216	3·79 ,,
1919	38	2·60 ,,

It is justifiable to state with assurance that litholapaxy is the operation of choice for the treatment of vesical calculus, but certain cases must be dealt with by lithotomy, either suprapubic or perineal. Where the operator has had no opportunities for acquiring skill with the lithotrite, the safest operation is suprapubic lithotomy. The advantages of the crushing over the cutting operation are obvious. The stay in bed and in hospital is short—in an uncomplicated case the patient should be out of bed in forty-eight hours and fit to leave the hospital in three or four days ; there is practically no loss of blood ; and there is no scar, as in the case of suprapubic lithotomy, and consequently no distortion of the bladder.

The cases in which lithotomy should be substituted for litholapaxy are :—

1. In very young infants. Children above the age of four do very well with litholapaxy, provided great gentleness and skill with the instruments can be obtained. In performing litholapaxy in children the stone must be crushed to fine dust, as only very small evacuators can be used. No force whatever must be exerted to pass either the lithotrite or the evacuating cannula, and the evacuation of the fragments must be done gently, very little force being used in squeezing the bulb of the evacuator. We were recently asked to see a child whose bladder had been ruptured during the operation of litholapaxy, and consider that suprapubic lithotomy is the operation of choice except in very skilled hands.

2. Stone complicated by very severe cystitis should be treated by lithotomy, so as to secure adequate drainage of the septic bladder, unless prior to operation the cystitis can be cleared up by rest in bed and irrigation.

3. Sacculation of the bladder complicating stone should, if of considerable extent, direct the surgeon's choice to suprapubic lithotomy rather than litholapaxy, as fragments may find their way into, and remain in, a sacculus. They will then form the nucleus of a further stone or stones, or, if sharp, possibly cause ulceration and even perforation of the bladder wall.

4. If the stone or stones are actually in a sacculus, the difficulty of picking them out with a lithotrite and then crushing them is great if the sacculus is a shallow, wide-mouthed one, and insurmountable if the sacculus is deep and with a small aperture.

Considerable enlargement of the prostate is not a bar to litholapaxy in skilled hands, but it increases the difficulty of the operation very materially, and the proper treatment, where the patient's consent can be gained, and his condition warrants it, is to remove the calculi by a suprapubic cystotomy, and proceed to a prostatectomy upon the same occasion, if the condition of the kidneys permit, or after a week or ten days' drainage of the bladder if that viscus is very foul and septic when the lithotomy is done. Stricture of the urethra, unless thoroughly dilated or cut, is an absolute bar to litholapaxy, for the first essential to the success of that operation is that the lithotrite should move easily and freely in the passage.

With regard to the size of the calculus and its composition, it may be said that the more skilful the lithotritist the larger is the stone that can be dealt with by litholapaxy. There is one variety of calculus, fortunately a very rare one, which if large should always be removed by cystotomy, viz., the cystin calculus. This material is so tough that the blades of the lithotrite have but little effect upon it if the stone is large. Usually the nature of the case is recognized only after an attempt has been made to crush the stone. It is wise to change the method in mid-attack, and substitute a suprapubic lithotomy for the litholapaxy.

Perineal lithotomy, either lateral or median, is but rarely seen now in this country. It is practically only required when perineal drainage is desired after the removal of the stone. It possesses no advantages over suprapubic lithotomy except that the patient can be got out of bed somewhat sooner. For the removal of very large calculi from contracted bladders, suprapubic cystotomy should be employed rather than litholapaxy or perineal lithotomy.

URETERIC CALCULUS.

Calculi which have left the kidney may be met with in any part of the ureter, but they are particularly liable to be arrested in three situations : (1) Just at the exit from the renal pelvis ; (2) At or just below the spot where the ureter crosses the iliac vessels ; and (3) At the entrance of the ureter into the bladder. The diagnosis of ureteric calculus is made from the symptoms, the physical signs, physical examination, and by the employment of radiography, cystoscopy, and ureteric catheterization.

Treatment.—When the ureteric stone is small, and in the lower end of the ureter, appropriate regulation of the diet, abstinence from alcohol, and limitation of sugar, cheese, and milk, combined with the administration of diuretics and a large amount of distilled water daily, will probably enable the patient to expel the stone *per vias naturales*. If, however, at the end of six weeks the position of the stone is unaltered, operative measures should be undertaken.

In some cases enlargement of the ureteric orifice by catheter or bougie, or by scissors through the operating cystoscope, combined perhaps with the injection of parolein, will enable the stone to pass. Below the brim of the pelvis, stones may be extracted from the ureter by a transperitoneal or an extraperitoneal operation. The transperitoneal is less desirable than the extraperitoneal method, not so much on account of the increased risk, for this is slight, as of the danger of the dense intraperitoneal adhesions which are likely to be formed if drainage is necessary and there is any leakage of urine through the incision in the ureter. We have seen such a case, in which the adhesions gave rise to fatal intestinal obstruction. In the extraperitoneal operation, the classical incision for ligature of the external iliac artery may be employed, but a muscle-splitting operation, with, if necessary, transverse division of the anterior layer of the rectus sheath and displacement of the muscle inwards, will give an adequate exposure of the ureter with less risk of a subsequent ventral hernia. By raising the level of this incision it may be employed in cases in which the stone lies a short distance above the brim of the pelvis ; but if the stone is at a higher level it is better to make an incision beginning in the loin in front of the transverse process of the last lumbar vertebra, and running forwards parallel with the curve of the crest of the ilium. This will give an exposure which allows the kidney and practically the whole of the ureter to be explored.

The ureter should be opened by a longitudinal incision, and after removal of the calculus a probe should be passed down the ureter to see that it is patent, and to exclude the possible presence of a stricture or another stone. The opening in the ureter may be closed by one or two sutures of plain catgut, but it is advisable to leave a rubber drain in the wound for twenty-four hours.

Operation through a parasacral incision may be exceedingly difficult, particularly if the stone is a small one, and is not to be recommended.

Calculous Anuria is the most serious complication of ureteric and renal calculi. This condition occurs usually when one kidney has for some time been doing the whole work, owing to the destruction of the opposite kidney by disease, or its removal by operation, or old-standing and complete obstruction of the opposite ureter by an impacted calculus, or possibly to congenital absence of the kidney. Calculous anuria does not always depend upon complete obstruction of the ureter by an impacted calculus, although in our opinion the term should be restricted to such cases. Suppression occurs sometimes after the removal of stones from one kidney, the other kidney also being full of stones. The shock of the nephrolithotomy is sufficient to induce suppression although neither ureter is blocked, and to this suppression the term calculous is sometimes applied. Very rarely both ureters may become blocked with calculi almost simultaneously, but usually by careful investigation of the history and symptoms it will be found that there is a longer history of symptoms upon the one side than the other.

If the patient is in good condition, and the situation of the ureteric stone can be determined, an immediate operation for its removal should be undertaken upon the lines already mentioned. If the stone cannot be localized, a nephrotomy should be done upon the side where the symptoms last appeared, for it is probable that the kidney in which the symptoms are of long duration is destroyed and functionless. Once the diagnosis is established, operation—either nephrotomy or ureterolithotomy—should be done at once ; for if the anuria is allowed to persist for any length of time the kidney will not secrete again. We do not know for what length of time a ureter can be occluded without permanently interfering with the secretion of the kidney, but Goyanes reported a case in which a ureter was accidentally occluded by a catgut ligature for fourteen days. At the end of that time the ligature was absorbed, and the kidney resumed its function. If a palliative nephrotomy succeeds in restoring the flow of urine, it should be followed, when the patient has sufficiently recovered, by a careful exploration for the obstructing stone.

When the anuria is not of the obstructive type, nephrotomy is the right course to pursue, with immediate removal of the stones from the kidney if the patient's condition is sufficiently good, or at a later period if this is deemed wiser.

RENAL CALCULUS.

Renal calculi vary from fine gravel to huge masses of stone completely filling and disorganizing the kidney. Cases of gravel are usually of two types, the alkaline and the

acid diathesis accounting for the difference, and it should be remembered that even when no definite calculi are formed, all the symptoms of renal stone may be caused by these conditions—lumbar pain, hæmaturia, and indeed true attacks of renal colic occurring in patients suffering from phosphaturia on the one hand or uric acid or oxalate storms upon the other. In the treatment of these minor calculous conditions, drugs, diet, hygiene, and the use of natural waters must be relied upon. Phosphaturia usually depends upon overwork and mental anxiety, and varies from the passage of a small amount of phosphates in the urine, accompanied by backache, lassitude, and general weariness, to the excretion of huge quantities of phosphates, coagulated sometimes into small calculi, and accompanied by severe attacks of renal pain, hæmaturia, and very often urgency and frequency of micturition, the latter due to the extremely irritating effect of the phosphate-laden urine upon the vesical and urethral mucous membrane.

Treatment.—This consists in giving, if possible, an entire change of life and scene. The over-driven brain-worker should have plenty of reasonable physical exercise in congenial and pleasant surroundings; a change to the sea-side is often most beneficial. The diet should be the fullest and most nourishing that the patient can digest, and alcohol in small quantities has very often a beneficial effect. If, however, the patient has lived very generously, alcohol should be prohibited, and sugar, cheese, and milk should be given up entirely, or only be taken in very small quantities. By drugs the urine can almost always be cleared of phosphates for a time. The writer has found the following prescription of great value in these cases:—

℞ Hexaminæ	gr. x	Acidi Nitrohydrochlorici Diluti	℥x
Sodii Phosphatis Acidi	gr. xx–xxx	Infusi Gentianæ Co.	q.s. ad ℥j

Three times a day, after meals.

Hexamine combined with dilute mineral acids and bitters seems to exercise an almost specific effect upon phosphaturia. When, however, it is very obstinate, a visit may profitably be made to one of the mineral water establishments; the best of these is Bad Wildungen, near Frankfort. A 'cure' at this spa, lasting from a month to six weeks, frequently completely clears up a case which diet, drugs, and careful hygiene at home have failed to influence markedly. The treatment of uric acid gravel, on the other hand, proceeds upon exactly opposite lines. A diet practically deprived of flesh, prohibition of alcohol and sugar, and the exhibition of alkalies and vegetable acids are indicated. The waters of Vichy, Contrexéville, and Aix-les-Bains are deservedly popular in these cases, owing to their success. In the writer's opinion the best mineral water for this condition is undoubtedly that of Contrexéville. It is claimed by those who have large experience that it not only induces a very free diuresis, thus diluting the usually concentrated urine of these patients, but that it possesses a specific action upon the musculature of the ureter, and so increases ureteric peristalsis. However well founded this belief may be, there is no doubt that a course of the waters at Contrexéville is often efficacious in causing the discharge of immense quantities of uric acid in the form of red gravel, the so-called cayenne-pepper gravel, and, in many instances, of quantities of small calculi.

Operative Treatment.—The surgeon has the choice of removing the stones from the kidney, or the kidney and the stones together: nephrolithotomy or nephrectomy. Nephrolithotomy is unquestionably the operation of choice, for, although a human being can exist with only about two-thirds of one kidney, the surgeon should always make every attempt to save as much kidney substance as possible. This is the more important, as calculi may subsequently develop in the opposite kidney, in which case operation is a much more serious undertaking, especially if the calculus is impacted in the ureter, or if it is complicated by suppuration. When the kidney is full of stone and is suppurating in all directions, immediate nephrectomy is of course advisable, but in all cases where there seems the least chance of saving the kidney, nephrolithotomy should be first performed, and be followed by a nephrectomy at a later date if the kidney obstinately refuses to heal: for even in advanced pyonephrosis, the kidney recovers in a remarkable way when the calculi have been removed and the sac has been drained.

Operation in cases of renal calculus is called for firstly to save the kidney, and secondly to save the patient's life. In this connection the practitioner should remember that stones may form and remain in kidneys, causing very slight symptoms, through the

whole of life. A small fixed stone in the renal cortex, provided no bacterial infection occurs, may exist with absolutely no symptoms, and such stones are not infrequently found in post-mortem examinations of patients who have never complained of symptoms referable to their presence. Such stones too may occasionally cause modified attacks of discomfort, pain, and transient hæmaturia and albuminuria. In such cases it is not essential to urge operation upon the patient, but when repeated and disabling attacks of pain and colic occur, together with evidences of renal destruction such as continued hæmaturia, albuminuria, and especially pyuria, it is the practitioner's duty to urge immediate exploration.

With regard to the technique of nephrolithotomy, the writer would urge the advisability of removing stones through an incision in the pelvis rather than the cortex of the kidney, whenever this is feasible. A vertical incision in the pelvis can be continued into the cortex at right angles to the long axis of the kidney if more room is required. This incision, running in the same direction as the renal vessels, is preferable to the incision along the convex border of the kidney, as it leaves far less cicatrization and consequent impairment of the functions of the kidney. If the operation is properly performed, there is little danger of a permanent urinary fistula.

John George Pardoe.
(Revised by Hugh Lett.)

CANCER.—(See also under respective regions.)

GENERAL TREATMENT OF PATIENTS.

In this short article no reference is made to treatment by operation, or by such specific means as *gamma* radiations or drugs stated to be able to modify directly the course of malignant disease. It deals only with the measures that appear to the writer to promote the comfort and well-being of patients suffering from this malady. Let it not be thought that these measures, although general, are unimportant. One often hears it said by the public that "the doctors have told so-and-so that they can do nothing more for him", because he has inoperable cancer. This is never true! Proper care can always help these patients, and do much to prolong life and lessen the distress caused by the disease. It is a striking fact that all the patients with advanced cancer who are admitted to the Middlesex Hospital Cancer Charity improve, at any rate for a time.

1. **Rest.**—It is very important that patients suffering from cancer should be spared all fatigue. It is well for many of these patients to continue at their usual work, but only while able to do so without getting tired. The heavy housework that many women are engaged in is very injurious to those suffering from cancer, and relieving them of it always has a marked beneficial effect. But these patients need not only to avoid general fatigue; they should particularly keep the diseased organ at rest as far as possible. A man with cancer of the tongue should talk as little as he can, and the taking of food should be rendered as simple and easy for him as possible. In cancer of the pharynx or gullet, food that is swallowed *easily* should be taken in preference to food that can only be swallowed with an effort; and in cancer of the rectum, the motions should be as far as possible reduced in bulk and softened in consistency, so that they may be passed easily through the narrowed bowel. The good effect of such palliative operations as tracheotomy, gastrostomy, and colostomy is certainly in part due to the local rest they secure.

Almost as important as general and local physical rest is mental rest. Worry is a bad bed-fellow under all conditions, but in none is it more injurious than in the subjects of advanced cancer. It is quite easy to get evidence of this. Part of the improvement that results from the admission of poor men and women into well-appointed cancer homes and wards is due to the mental rest they thus secure. If for any reason this mental rest is broken in upon, as by bad news from home, the misbehaviour of some member of their family, or the sudden death of a patient in the same ward, it is quite common to see the result in physical ill-consequences such as increased pain and discharge, sleeplessness, rise of temperature, and even increase in a growth or aggravation of ulceration and sloughing. Again, it is striking to see how 'kindly' the progress of the disease often is in placid, cheerful subjects, while it is always worse in those of irritable, fretful, and gloomy dispositions. Of course, these conditions have also the converse relationship. Increased dyspnœa and dysphagia will induce grave anxiety, severe hæmorrhage and pain will depress mentally as well as physically. But after freely admitting all this, observation, now

extended over many years, of cases of cancer in their later stages has convinced me that the other side is still more true, and that mental 'worry' has a distinctly injurious effect upon the course of the disease. Nothing is more remarkable than the power many women and some men have of maintaining a placid mind, and even a cheerful temper, through what to those around them is a long and distressing illness.

2. **Cleanliness.**—It would be difficult to exaggerate the importance of securing cleanliness in cases of cancer. It is only equalled by the difficulty in obtaining it in some of the cases.

General cleanliness of the body is valuable, and the services of a good nurse who will not neglect this part of her duty, even to the end of the case, and, it may be, in opposition to the wish of her patient, are invaluable. But it is to the value of local cleanliness that I wish to draw particular attention. For example, in cases of cancer of the mouth, every care should be taken to keep the teeth clean, to deal with pyorrhœa—which is often present—to remove discharge and particles of unswallowed food, and to get away sloughs. All manipulations must be gentle, and the very frequent and thorough use of cleansing lotions such as Sanitas and water, or weak solution of permanganate of potash, will be the chief means employed. But special attention should be paid to the teeth ; and where a brush can no longer be used, each tooth should be carefully cleansed with a small dossil of wool. The mouth should always be well irrigated before and after taking any food. Loose teeth should be extracted.

In cancer of the uterus, the frequent use of carefully given vaginal douches is of great value. The fluid used should be at a temperature of 105° to 110° F., feeling to the patient definitely warm. It may be of Sanitas and water, or a weak solution of cyllin in water (½ drachm to a pint), or of lysol or chinosol. Formalin is sometimes used : when strong enough to be effective it is apt to be very painful. When there is hæmorrhage, the fluid should be as hot as the patient can bear—about 120° F. The douche should always be given through a soft rubber nozzle, and in a gentle stream. Where a fistulous communication has formed with the rectum or bladder, every care must be taken to keep the parts clean by frequent douches and the use of pads of absorbent material such as compressed moss or peat.

In cancer of the rectum, comfort is given by gently washing out the rectum once or twice a day. In cases of colostomy, the bowel below this should always be kept as clean as possible, and whenever practicable one of the lotions mentioned above should be run through the bowel from the colostomy opening to the anus at least twice a day. This greatly promotes the patient's comfort.

In external cancer, the surface should be kept as clean as possible, sloughs should be removed, discharge washed or wiped away, and the part carefully dressed. In some cases an ointment, e.g., lanocyllin, is best ; in others, a wet dressing or hot fomentation is more comfortable. The application should be unirritating, antiseptic, and as a rule, deodorant. Sanitas, peroxide of hydrogen, cyllin, lysol, weak carbolic lotion, iodoform, iodine, vaseline, all have their uses.

3. **Diet.**—The diet should be an ordinary mixed diet ; I have not seen any advantage from excluding either animal food, vegetables, or fruit. I would not exclude any ordinary article of diet, provided it is properly prepared and known to have suited the individual previously. I believe it to be advantageous to have mixed diet. Thus, in cases where gastrostomy has been performed, and the patient is fed through a tube, it is well to have a large tube such as a No. 18 catheter, and to encourage the patient to take not only milk and egg, but thickened soups, pounded meat, and any farinaceous foods or sieved vegetables and fruits that can pass through the tube. But while a mixed diet is of advantage, there is no good to be gained by overfeeding patients who have cancer ; in the late stages especially, they are usually more comfortable with quite small meals.

4. **Alcohol.**—Alcohol has a distinct influence upon the incidence of cancer, and it is equally injurious upon its course. A free use of alcohol markedly increases the rapidity of the progress and the pain, hæmorrhage, and discharge attending a malignant growth, and it shortens the life of its victim. The entire withholding of alcohol is to be recommended ; the patients are more comfortable, and the course of the disease is less distressing if none is taken.

5. **Constipation.**—It is very important to secure the regular action of the bowels of

all patients suffering from cancer. Constipation adds to pain and to restlessness. On the other hand, strong purgatives are to be avoided ; a sufficient motion every day—or at least every other day—is the desideratum, and this should be secured by the simplest and blandest means. Care in diet, and the inclusion of sufficient vegetables and fruit, often suffices ; but very often laxatives or a daily enema are also needed. It is well worth while to take trouble to find the drug and the exact dose of it which secures the desired end without painful or excessive action.

6. **The Relief of Pain.**—It is sometimes said that the free use of morphia is the great indication in the treatment of inoperable cancer. Such a statement is the reverse of the truth. If possible, morphia should not be given at all, and its use should always be carefully restricted and kept within the narrowest limits. If not, it may cause more suffering than the disease itself. In the Middlesex Hospital Cancer Charity, where there are always between 90 and 100 patients suffering from cancer in its later stages, morphia is now used very much less than formerly ; a hypodermic injection has become an infrequent occurrence ; months often elapsed without one being given in a ward of 32 patients. A small dose of nepenthe or of the solution of morphia, or a small suppository of morphia, is sometimes necessary, but reliance for the relief of pain is chiefly placed upon such drugs as phenacetin and acetylsalicylic acid. Care in carrying out the treatment already mentioned has greatly lessened the pain that needs to be relieved. It is important to remember that the pain in cases of cancer is notably lessened in the latest stages of the disease as a rule ; and as all anodynes are to some extent injurious, their use must not become a mere routine, but they must be taken when actually necessary for the relief of present pain. We are often able to suspend their use altogether.

Other measures to relieve pain are local heat, *x* rays, radium, and the division of sensory nerves. The division of the posterior spinal nerve-roots is justifiable where pain is extreme and the sensation is conveyed along a limited number of nerve-roots.

7. **Hæmorrhage.**—This is a frequent incident in cancer. It is often prevented by the use of radium, especially in cancer of the uterus or of the rectum. It is to be generally dealt with by strict rest and the gentle use of douches as hot as can be borne ; in some cases a styptic may be added to the fluid. In external cancer, a cavity can be plugged, or a bleeding point treated with a pledget of wool on which is some powdered dry sulphate of iron, which is gently pressed upon the spot and left adherent to it. Operations to arrest hæmorrhage or to relieve the consequent anæmia should not be performed in cases of inoperable cancer.

Colostomy, performed for other reasons, often does further good in lessening the hæmorrhage from a very vascular and bleeding cancerous growth in the rectum.

8. **Sunshine.**—Patients with cancer should of course be nursed in very well-ventilated rooms, and care should be taken to keep the room as bright and sunny as possible, e.g., a room with a southern aspect should be chosen, heavy curtains and blinds should be dispensed with, and the patient's bed or chair be placed near the widely-opened window. Whenever feasible, patients should spend as much of their time as possible resting out of doors in the sun—not under the shade of trees or under balconies. I think that the value of out-of-doors treatment is not due solely to the 'fresh air', but quite as much, if not more, to the effect of direct sunlight. At any rate, I think I have seen so much advantage from it that I am justified in laying stress upon the importance of this point.

9. **Mental and Moral Atmosphere.**—The last point I would refer to is the importance of keeping the patient in a bright mental and moral atmosphere. As far as possible conversation should be on other subjects than the illness and its details. Depressing visitors and books should be forbidden, cheerful companions are most helpful, and pains should be taken to make all the surroundings of the patient as bright and cheerful as possible. And this raises the point of whether we should let the patients know the nature of their ailment, and the gravity of the prognosis. The writer is convinced that far too much stress is laid upon the importance of concealing these facts from patients. He has not seen any distressing results from frank but kindly-phrased answers to questions. On the other hand, he has known much additional distress arise from unnecessary concealment and deception, and in some cases quite serious and unnecessary complication in the management of the case caused by it. It is not the surgeon's duty to volunteer information of the nature and course of the case, nor to tell his patient the details of possible

future developments ; but it is equally not his duty to deceive his patient, and he need have no fear of the consequences of kindly, truthful answers to questions. In no case, however, should he venture to state how long a patient with cancer is likely to live. The surgeon does not know, and it is never wise to try to lift this veil.

Alfred Pearce Gould.

CANCRUM ORIS.—(*See* STOMATITIS.)

CARBONIC ACID SNOW, TREATMENT BY.—Solid carbon dioxide was first introduced into therapeutics by Pusey, of Chicago, in 1907, and most of those who have had a large experience in its use will agree that it is one of the most remarkably successful therapeutic agents of recent years.

Its advantages over other freezing methods are both numerous and striking. It is plentiful, cheap, and easily obtained ; the preparation of the solid crayon is not difficult, it can be moulded, shaped, or cut to any desired form, and its temperature remains constant. This, while low enough for our purpose, is not so low as that of liquid air, so that its action is under the most perfect control. The application is attended with so little pain or discomfort that no anæsthetic, either local or general, is ever necessary. In any case the application is a matter of seconds only, while the time between the application and the reaction is a matter of minutes. A blister often follows, and after this a crust forms, which is allowed to come off in its own time—a week or ten days after the application. Not the least of the properties of this substance is its very high efficiency. Success is the rule, failure being almost always due to faulty technique or to its use in unsuitable cases.

Preparation.—Many different forms of apparatus for the easy and rapid preparation of the snow are now to be obtained from most instrument makers, and as full instructions are always sent there is no need to give further details here. The main requirement is a cylinder of the compressed and liquefied gas. Owing to its extensive use in the aerated water and other industries, these cylinders are very easily obtained and are quite inexpensive.

The pressure inside the gas cylinders is about forty atmospheres. They are provided with a valve that can be controlled by the hand easily. When the liquid is allowed to escape through the small opening made by giving the valve a slight turn, rapid expansion and evaporation take place, with the result that intense cold is produced and a certain portion of the escaping liquid becomes frozen into a semi-solid, like ordinary snow.

The cylinder, when obtained, is mounted on a stand at a convenient height, so arranged that the valve end is some inches lower than the other. This ensures that the liquid lies over the inner side of the valve. The cap screwed over the outlet is removed with a spanner, and a short nozzle screwed on in place of it. If a chamois-leather bag be held over the opening while the valve is opened the snow is collected, and may then be moulded into a crayon by compressing it in a short length of metal tubing ; this latter may be of any convenient size or shape. This simple method may be adopted if more elaborate apparatus is not available. Owing to the rapid evaporation of the crayon, it frees itself from the inside of the tube in a few seconds, and is easily pushed out. A turn or two of lint is wrapped around it and it is ready for use. In this state it can be cut with an ordinary knife, or shaped by pressing it against any metallic mass, to suit the requirements of any case we may wish to treat.

The snow returns to the gaseous form fairly rapidly, without an intermediate liquid stage. It is this evaporation which keeps the crayon at its low temperature, and makes it possible to hold a piece loosely in the hand without injury ; it floats on a cushion of its own gas, and is really never in actual contact with the skin under such conditions. The return to the gaseous form is not so rapid as to cause inconvenience : a crayon one inch in diameter, freely exposed in an ordinary room, will last for from one to two hours, and much longer if wrapped in cotton-wool or placed in a thermos flask, the mouth of which is to be stopped with cotton-wool and not corked.

Lately the use of this snow with ether has been revived. We experimented with this in 1909, but as it did not appear to have any special advantages its use was not continued. If a solid crayon is immersed in ether, it becomes softer, more translucent, and the temperature is lowered to some extent. The lowering of temperature is not

sufficient to compensate for the loss of solidity. If, however, the soft snow is added to a small quantity of ether, after a little preliminary ebullition it appears to dissolve in the latter, and a colourless semi-gelatinous 'solution' is formed. It may in fact be looked upon as a mild substitute for liquid air. It can be applied with a brush or swab, and has been found useful for some superficial conditions, and also for application to the mouth, nose, and other cavities.

Mode of Application.—This is very simple, but to get uniformly good results a certain amount of practice and experience is necessary. The difficulties are very much reduced by the fact that the temperature of the crayon is always a constant one, viz., – 79° C. (– 110° F.). If its temperature rises ever so little above this it becomes gaseous. Thus the surface of the crayon is being constantly renewed.

The crayon is held in the hand with a small piece of lint, and after the end has been shaped to the part to be treated, it is pressed against the latter firmly for a period of from ten to sixty seconds, or even more in special circumstances. The degree of pressure to be employed depends upon the depth of the reaction required ; but in dealing with nævi and vascular growths generally, the pressure should be sufficient to arrest the circulation. If this is not efficiently done the result is not satisfactory. Practical experience in the treatment of a few dozen cases will teach one what cannot be learnt in any other way.

Effects of the Application.—It will be most satisfactory to describe what takes place when an average case of capillary nævus is treated by this method. The crayon, having been suitably prepared and shaped to fit the growth as accurately as possible, is pressed down on to the nævus firmly for from thirty to forty seconds, according to the thickness. On the crayon being removed, the depression made by it remains, and the depressed part is white and hard, like a piece of china. The part returns to its normal contour in from two to three times the duration of the application, and when the thawing is complete the surface is seen to be covered with the moisture of condensation.

The reaction sets in almost immediately, and within a few minutes the part is of a firmer consistency than normal, and is beginning to swell. A wheal quickly forms which is well developed within an hour. Vesication almost always follows an application lasting twenty or more seconds. When a vesicle forms, it should be relieved with a sterile needle and dressed with an antiseptic ointment. Very small patches may be sealed over with cyanide gauze and collodion. A crust forms in about four or five days, and this should be left to come off of its own accord. After a properly made application of solid carbon dioxide there is no necrosis or sloughing ; an intense reaction is set up, in the course of which the abnormal or diseased cells are removed.

The intensity of the reaction following an application depends upon the time the crayon has been in contact and, to a less extent, upon the degree of pressure. With the proper manipulation of these two factors we are in a position to set up any degree of reaction we may wish, from a mild and transient hyperæmia to a complete necrosis.

A second freezing, immediately following the first, intensifies the effect considerably, and if done the following day, has an even more pronounced effect. This is of value in dealing with fleshy moles and the 'port-wine stain', which remain the most unsatisfactory forms of nævus to deal with.

Indications.—The conditions in which this agent is of use are very numerous, and of special interest to dermatologists. Speaking generally, localized lesions of the skin are the peculiar province of solid carbon dioxide, whether they be new growths or disease. It is specially applicable to the treatment of nævi where these do not extend too deeply, and where the circulation is not too free, as in the cirsoid aneurysm.

The great majority of *capillary nævi* may be completely removed by a single application of about forty seconds' duration, with firm pressure. Owing to the weak and fragile nature of the tissue making up this form of nævus, the top of the growth nearly always sloughs off. This, however, is no disadvantage, as the result is better than can be obtained in any other way. If the outer covering of the nævus consists of ever so little sound skin, this is not destroyed if the application is properly timed. In most cases the result is a pleasing, soft, and elastic scar, closely resembling the surrounding skin.

Cavernous nævi are not so favourable for this or any other treatment, but the great majority can be dealt with successfully. The pressure must be very firm, and where

possible it should be made against an underlying bone. Also full time must be given so that the freezing may reach to the lowest part of the growth. If there should be a covering of skin, this is destroyed sometimes, but not as a rule, though the reaction has to be severe.

Port-wine marks are the most troublesome variety of nævus to deal with, probably owing to the fact that they are made up of an overgrowth of normal tissue elements, and as such are very difficult to destroy. In spite of this, solid carbon dioxide gives as good results on the whole as any other method, besides having advantages of its own. The vessels being quite superficial, in most cases no great amount of pressure is required, and an application of about thirty seconds is sufficient. The first application to any given area has very little effect in taking out the colour, but with the subsequent applications the difference is very noticeable. We must always take care to do as little destruction as possible on each occasion, so as to avoid the appearance of a scar. A course of treatment is of necessity very prolonged, but it gives rise to little inconvenience, and is always worth doing. This is an instance where the snow 'solution' in ether may be substituted for the solid crayon. Only a very superficial reaction is required in most cases, and the lower temperature of the solution is an advantage.

Moles are, as a rule, very resistant, consisting as they do of an overgrowth of normal cells. They can always be removed, however, by this method, with a minimum amount of inconvenience, though some of the fleshy moles require four or five applications before the surface is level with the surrounding skin. The hairy pigmented mole is better treated by electrolytic epilation.

Common warts and corns can be removed very successfully. The crayon is trimmed down to the size of the wart, and the application is continued until a narrow zone of normal tissue around the base is frozen also. The conducting properties of this form of growth are so poor, that in treating a thick and dry wart the application may have to be as long as five minutes, and even more in some cases. In the reaction that follows the whole wart is lifted off bodily, and does not tend to recur.

One of the latest of the many successful applications of solid carbon dioxide is in the treatment of *rodent ulcer*. So far as our experience goes, it seems safe to assert that any simple case of this disease that does not involve bony structures can be cured by a single application. The surface of the ulcer must be first cleaned off with a sharp spoon ; this, if done gently, causes very little discomfort. The slight bleeding that follows is arrested by pressure with a pad of absorbent cotton. The crayon is made the shape of the ulcer, but slightly larger, and firmly pressed on the latter for about forty seconds. After thawing, the place is dressed in the usual way with an antiseptic ointment. Healing is generally complete in three weeks' time, and after the first few days the area has all the appearances of a healthy, healing ulcer, and behaves as such until scarred over. Some cases treated three years ago show no sign of recurrence, and the scars are all that could be desired. This is a very important gain to the therapeutics of this disease. Compared with other methods, it is the cheapest and quickest, and, so far as our present knowledge goes, is as efficient as any of them. For cases of long standing, and especially recurrences after other forms of treatment, this method offers no special advantages.

There seems to be little doubt that freezing by this method has a definite value in *lupus vulgaris*. The method is essentially the same as for rodent ulcer, and the subsequent care of the treated areas must be thorough in the way of antiseptics and general cleanliness. In a number of the cases we have treated there has been little difficulty in getting the patches to heal without showing nodules when tested with the glass spatula.

It has a good effect in *lupus erythematosus* also, but it cannot be said to be any better than other remedies for this troublesome condition. Parts that are treated by freezing generally heal well enough, but the tendency to spread is not affected thereby. It forms a very useful alternative to other applications, and is at least as good.

Patches of *chronic eczema*, such as so often remain after a more general attack, can usually be removed by short applications of the snow. Ten seconds is generally long enough, and after the first sensations have passed off, in half an hour or so, it is noteworthy that the maddening irritation of the eczema ceases completely, though a brisk reaction may be set up. Here we have an instance of an artificially produced healthy reaction overpowering and removing an unhealthy one.

Urethral caruncle may be treated by this method. The growth and surrounding parts are freely painted with cocaine solution, and after waiting a few minutes, the crayon is applied to the caruncle and also to the base from which it sprang, each for a period of thirty seconds. The caruncle separates in a few days.

Small uncomplicated *internal hæmorrhoids* may be successfully treated by this method. It is not always easy to apply the crayon to the best advantage, and under these circumstances the ether solution may give better results. There is usually no pain, and frequently the patient's usual habits are not interfered with in any way.

Numerous cases of *trachoma* have also been treated, and here carbonic acid snow seems to be more efficient than copper sulphate, and is much less painful. The crayon is shaped to a semicircular form and pressed against the everted lid for from ten to twenty seconds. The sensation is of course not at all pleasant, but it is not nearly so severe as with other applications: the most discomfort is the thawing out, but even this is not so severe as to cause complaint.

There are numerous other conditions in which this agent may be employed with a reasonable prospect of success. It has secured a well-established position in therapeutics, and for the treatment of nævi we may say that it is the most generally useful method at our disposal, this statement being based upon an experience of about 2000 cases, some of which were better dealt with by other means. *Reginald Morton.*

CARBUNCLE.—The association of this condition with diabetes, albuminuria, and other debilitating conditions must always be borne in mind. Not that these states necessarily preclude the successful treatment of carbuncle by operation; indeed, in many cases there is an improvement in the glycosuria or general condition after the local infective process has been satisfactorily dealt with. At the same time it will be advisable to consider how far the administration of an anæsthetic is likely to be injurious. If the general condition is on the whole good, radical local treatment under anæsthesia should be resorted to; if, on the other hand, constitutional disease is advanced, the minimal amount of local treatment necessary should alone be attempted.

A second detail of practical importance in connection with the pathology of carbuncle is the fact that the vessels in the substance of the inflamed area being in a state of infective thrombosis, there is danger of the spread of systemic infection or pyæmia. Carbuncles on the face or scalp are especially dangerous, since the free communication between the superficial veins and the cranial venous sinuses renders the latter liable to fatal thrombosis.

The patient must be liberally fed and well supplied with alcohol, the bowels should act freely, and every effort be made, with tonics, iron, and quinine, to improve the general health. If the pain is excessive, morphia may be given, though the need for this drug must be made subservient to the state of the kidneys.

Local Treatment consists in:—

1. Complete excision of the whole infected area wide of the disease. This can be practised only occasionally, but is very satisfactory. The resulting wound, after thorough disinfection, is lightly packed with gauze and allowed to granulate.

2. Scraping out the gangrenous core, and the application of pure carbolic acid. It has been urged against this line of treatment that there is some danger of the clots becoming dislodged and carried into the circulation, with the result that pyæmia is set up. If the operation is carried out thoroughly, so that the deep fascia at the bottom of the wound is well exposed, and all the indurated tissue at the periphery of the necrotic area is radically treated, there is little danger of this accident occurring; it is much more likely to supervene if the operator is over-cautious, and merely stirs up the centre of the process with a timid hand.

3. I have lately treated a number of carbuncles, especially in debilitated subjects to whom I have been disinclined to administer a general anæsthetic, in the following way. The carbuncle is fomented until the central core softens, and then a small piece of lint is cut the exact size of the carbuncle, and soaked in the following: glycerin of carbolic acid 1 part, glycerin 1 part. The soaked lint is then applied to the carbuncle accurately; a small piece of oiled silk is placed over the lint, and the whole is covered with a gauze dressing. If there is any tendency of the lint to shift, it must be kept in place with

strapping. I have found this method very satisfactory, and the glycerin excites a free flow of lymph. Care must be taken, however, that only a small piece of lint is used, as the solution of carbolic acid is very strong. Good feeding and tonics are essential adjuncts to successful treatment. I am less inclined to operate on carbuncles than formerly.

4. Incisions, usually crucial, may be made into the swelling, and 5 to 10 minims of pure carbolic acid injected into various points of it. The wound is then fomented and the dead material allowed to slough out.

Bier's suction treatment (q.v.) has given good results in the treatment of boils and carbuncles.

Under all conditions it is wise to apply fomentations (carbolic) to assist the sloughs to separate, and a careful eye must be kept on the wound, since the pus occasionally has a tendency to burrow away into the surrounding tissues.

As soon as the sloughs have separated and healthy granulations have made their appearance, the wound should be dressed with protective, and if the epithelium is slow in covering the surface of the wound, skin-grafting may be employed.

W. H. Clayton-Greene.

CARCINOMA OF THE COLON.—Cancer of the colon can be very successfully treated by operation, and excellent results have been obtained both as regards the patient's subsequent comfort and freedom from recurrence of the tumour. Everything depends upon an early diagnosis before metastasis has occurred and while the growth is still well localized to the bowel wall, the exact situation of the growth being a very important factor.

It is necessary to distinguish between operations for cancer of the colon *per se*, and operations undertaken for acute obstruction due to cancer of the colon. In the latter case the operation is undertaken primarily for the obstruction, and it may often be necessary to perform a second operation for the removal of the growth. The best results in such cases are probably obtained by resection of the growth and bringing out the two ends of the bowel, the temporary colotomy thus formed being subsequently closed by a second operation. When obstruction is not present at the time of operation, the operation will consist in resection of the affected portion of bowel, the surgeon being careful to allow a good margin of healthy bowel on each side of the growth, and to remove as far as possible the lymphatic field draining the affected area. This may sometimes involve considerable removal of the mesocolon, and great care must be taken to ensure that the blood-supply to the ends of bowel which are about to be anastomosed has not been seriously interfered with. After the removal of the growth the ends of the colon may either be joined end to end by direct suture, or the ends may be closed and then joined by lateral anastomosis, or the ends may be brought out of the abdomen, as in Paul's operation, and a temporary colotomy established, the spur being subsequently divided by an enterotome and the external opening closed by a second operation. This last method, although it may involve two or even three operations, and although it puts the patient to the inconvenience of a temporary colotomy, appears from statistics to be by far the safest method, and it should be adopted except in very favourable cases.

It seems certain that cancer of the pelvic colon is often of a very favourable character as regards its malignancy. Spread into surrounding structures is slow, and when these growths are removed they exhibit no serious tendency to recur. This should be borne in mind, as many cases which at the operation seem unfavourable prove, when the growth has been removed, to be most successful. Providing there is sufficient room below to allow of an anastomosis, very free removal of the colon is possible.

Diverticulitis of the colon may so closely simulate cancer as to be distinguishable from it only on microscopical examination. It usually imitates inoperable growth owing to the adhesions, etc., present. A careful examination of the bowel will show diverticula in the appendices.

Summary.—

1. In cases where acute obstruction is present at the time of operation, a temporary artificial anus should be made, or the growth should be excised and the ends of the bowel brought out.

2. At least an inch of normal bowel should be removed on each side of the growth.

3. Whenever possible the lymphatic area should be cleared with the growth.

4. Immediate end-to-end anastomosis after excision is safer when dealing with the right half of the colon than with the left.

5. Colotomy followed by excision is a safer operation than excision with immediate anastomosis.

6. The presence of enlarged glands or adhesions to other structures does not necessarily contra-indicate resection.

7. The possibility of DIVERTICULITIS (q.v.) must be borne in mind, as it is easily mistaken for cancer. *J. P. Lockhart-Mummery.*

CATARACT.

Anterior and Posterior Polar Cataracts do not, as a rule, require any treatment.

Complete Congenital Cataract.—These cataracts are often—though by no means always—associated with other defects, both general and ocular. Thus the child may be badly nourished, slow in development, deficient mentally, or there may be nystagmus, microphthalmus, or other signs of imperfect ocular development, or signs of past inflammation of the iris or ciliary body.

It is well known that operations on these cases are often disappointing in their results, or they run a complicated course. This does not necessarily contra-indicate operation—for many cases do well, and those which do not do well are little worse off than they were before; but it should make us very careful to give a guarded prognosis, to examine the child very thoroughly, and to operate only when it is in the best possible state of health.

Age for Operating.—The sooner the child can be made to see, the better for its mental development, and for establishing ocular co-ordination. The operation can be performed immediately the cataract is discovered, even in the first few weeks of life, if the health be good. Later on, teething is no deterrent to operation, unless it is impairing the health, in which case any operative procedure should be postponed.

These cataracts are either fluid, or they contain soft lens matter, or on the other hand they are shrunken, hard, even calcareous, or membranous.

When they are fluid, needling is all-sufficient; when they contain soft lens matter, a curette evacuation in addition may be necessary later on. (It is important to recognize that in some of these cases the pupils do not dilate with atropine; it is advisable here to do a small iridectomy upwards before needling, lest the swollen lens lying behind the contracted iris push this forwards and produce a glaucomatous attack—an awkward complication at this age and in so small an eye.)

In the shrunken form needling should be tried first; but it may be ineffective, and then the capsule may have to be removed bodily with forceps, in order to obtain a clear opening.

Lamellar Cataract.—As this condition often impairs the sight only slightly, it is, as a rule, only discovered either at the beginning of or during school life. We therefore meet with these cases at a time of life when it is possible to estimate the acuteness of vision.

We must determine: (1) Which cases should be operated on: and (2) What operation should be selected.

Though many cases of lamellar cataract get normal acuteness of vision with glasses after operation, yet vision of $\frac{6}{12}$ must be considered a good result, and patients have often to be content with $\frac{6}{18}$. We may take it, therefore, as a good working rule, that if the vision is $\frac{6}{12}$ or better, no operation should be undertaken; if the vision is worse than $\frac{6}{18}$, an operation may be advised. Vision of $\frac{6}{18}$ forms, as it were, a dividing line. If patients are healthy and intelligent, an operation is advisable; if mentally defective, operation will probably not improve the acuity. It must be remembered, in weighing the pros and cons of operation, that by removal of the lens all accommodative power is lost, and the patient is rendered entirely dependent upon glasses. Two pairs have to be carried, one pair for distance, and one for close work; so that for some individuals vision of $\frac{6}{18}$ with accommodation and without glasses may be more useful than greater acuity with entire dependence upon spectacles.

OPERATION.—There are two different methods of improving vision in lamellar cataract: optical iridectomy, and removal of lens by needling.

Iridectomy is useful only when the opacity is small and the periphery of the lens is clear, and when atropine, by dilating the pupil beyond the opacity, improves the vision very considerably. It has the great advantage that accommodation is left intact.

As a rule, unfortunately, the periphery of the lens is so irregular in its refraction that a good retinal image is not obtained through the coloboma. It is absolutely contra-indicated if the vision is deteriorating. If a needling has subsequently to be resorted to, a coloboma is a great disadvantage—being a disfigurement and a cause of dazzling, by producing a large and irregular pupil.

Needling aims at removing the opaque lens and giving a clear pupil—the place of the lens being taken by spectacles.

For details of operation, see works on ophthalmic surgery.

After-treatment.—The main points are the prevention of iritis, keeping the pupil well dilated to allow the soft lens matter to pass through into the anterior chamber, and watching the tension of the eye, lest the accumulation of soft lens matter induce secondary glaucoma. If this occurs, the soft matter must be let out by a curette evacuation. Evacuation is frequently necessary when the lens swells up rapidly three to eight days after needling; and, indeed, without any rise of tension many surgeons remove the soft lens matter to hasten the clearing up of the lens. The eye is kept bandaged for at least four days, a round of cyanide Gamgee tissue being used as dressing.

The main dangers of needling are :—

1. *Sepsis.*—Prevention thereof by bacteriological examination of the conjunctival sac previous to operation, and scrupulous asepsis, is all-important; but should this unfortunate accident take place, an immediate attempt should be made to save the eye. (*See* Senile Cataract.)

2. *Increased Tension.*—As mentioned above, this is treated by letting out the soft lens matter, and keeping the pupil well dilated with atropine.

3. *Iridocyclitis.*—Treated by leeching to the temple, hot bathing, atropine, purging, and rest.

Traumatic Cataract.—For the treatment of complications arising immediately after injury of lens, *see* Eye, Injuries of.

Most cases of traumatic cataract are *monocular* and complete, and we have to decide whether an operation is advisable. The cases may be divided into two classes : (1) Those in which the other eye is normal; (2) Those in which the eye with the traumatic cataract is the better one of the two.

1. Cases in which the other eye is normal. The advantages of removing the cataract are :—

a. To increase the field of vision. This is the chief advantage; and it is of great importance, both to those who follow an occupation dangerous to one-eyed individuals (e.g., mechanics and sportsmen), and those whose occupation under such conditions is a danger to the public (e.g., coachmen, chauffeurs, etc.).

b. To improve the appearance—substitution of a black pupil for a white one. (A man may be unable to get a suitable occupation if one eye is unsightly.)

On the other hand, intra-ocular operations, especially upon injured eyes, are not unattended by risks. To cause sympathetic ophthalmia and blind the good eye in trying to gain a slight increase in the field of vision, is little short of a tragedy both to the patient and surgeon.

Also, it must be remembered that, however successful the operation may be, *binocular vision* will never be regained. The eye without its lens, even though supplemented by a strong convex glass, never works in double harness with a normal eye. Therefore, operation on a monocular cataract must never be undertaken lightly, and without having duly considered whether the risk is worth running for the particular individual.

2. Cases in which the eye with traumatic cataract is the better eye must, of course, be operated on; care being taken that both the patient and the eye are in the best possible state for undergoing the operation.

It may be stated generally of both these classes :—

a. Where the cataract has been caused by concussion, without penetration of the globe, and where there has been little or no cyclitis following the injury, operation—needling, with curette evacuation where necessary—may, as a rule, be performed with

a good chance of success ; cases where the cataract has been due to a penetrating injury, followed by severe and prolonged cyclitis, stand interference badly.

b. No operation should be attempted :—

i. Till at least two months have elapsed since all traces of injection of the eye have disappeared.

ii. While any keratitis punctata is present.

iii. If the projection is not perfect.

iv. In the presence of conjunctivitis or mucocele.

Senile and Complicated Cataract.—In dealing with a case of cataract we must find out whether the lenticular opacity is the sole disease, or whether it is complicated by some other ocular disorder.

1. The history should be obtained as to how long the sight has been failing ; whether there has been any injury, pain, or sign of inflammation ; whether the sight was good or bad, short or long, before the vision began to fail.

2. The pupil should be tested, and examined for adhesions, as indicative of past iritis.

3. The cornea should be examined for opacities or keratitis punctata indicating cyclitis.

4. The depth of the anterior chamber must be noted.

5. The tension must be carefully examined (to exclude glaucoma complicating the cataract).

6. Tremulousness of either lens or iris must be noted.

7. The vision should be tested ; any improvement that may be obtained with glasses being recorded.

8. The opacity in the lens is next investigated* ; the type of cataract being noted, and whether it is *mature* or *immature*. (A cataract is *immature*, when the cortex of the lens is not yet opaque ; and *mature*, when the opacity extends throughout the cortex as far as the capsule of the lens. The two conditions are distinguished clinically by means of oblique illumination : thus, in immature cataract, the cortex being clear, the iris throws a visible shadow on the cataract ; while in mature cataract, the opacity extending to the capsule, the shadow of the iris is not visible.)

9. The fundus should be examined, if possible, and a note of the macula, when visible, should be made for future reference. If the opacity be too dense for examining the fundus, the examination of the fundus of the other eye, when possible, may give useful information.

10. The projection of light must be tested. Bad projection would indicate some disease in the fundus, e.g., optic atrophy, detachment of the retina (possibly associated with sarcoma of the choroid), or some other severe disease of retina and choroid.

11. Conjunctivitis and mucocele of the lachrymal sac should be carefully looked for.

A bacteriological examination of the conjunctival sac should be made in every case before operation. *Staphylococcus aureus*, streptococcus, and pneumococcus are especially dangerous, and when found the conjunctival sac should be painted daily with a 1 per cent solution of silver nitrate, until cultures show that these organisms are not present, before operation is undertaken.

12. The urine must be examined, especially for albumin and sugar.

With a history of defective sight, previous to failure of vision, especially when due to very high myopia, one must suspect the possibility of central macular changes and a fluid vitreous, and a guarded prognosis is given. We have to be prepared for some vitreous being lost at the time of extraction, and the scoop may have to be used, and convalescence is likely to be prolonged.

If there are signs of iridocyclitis, an interval of at least two months should elapse after all signs of active inflammation have disappeared before operation is attempted.

If increased tension is present, a preliminary iridectomy for the glaucoma is indicated.

If the iris or lens is tremulous, the suspensory ligament is probably faulty. Vitreous will very likely be lost, and the lens will have to be delivered with the scoop.

Cataract with bad projection should not be operated on.

---

* A mydriatic (one drop of a 2 per cent aqueous solution of homatropine and cocaine) should, as a rule, be given to ensure the best possible view being obtained. This must be followed by instillation of eserine (2 gr. to the ounce) after examining, to prevent a possible attack of glaucoma.

Extraction is contra-indicated in the presence of *conjunctivitis*, and still more so in the presence of a *mucocele*. This latter should be treated by conservative methods first, and, if they fail, the sac should be excised previous to the removal of the cataract.

If sugar be present in the urine, an attempt should be made to reduce it by dieting and drugs before operating. When acetone or diacetic acid is found, operation should be postponed, owing to the liability to coma which their presence indicates. Those cases in which the sugar can be reduced do well, as far as operation is concerned, though a previously invisible diabetic retinitis may vitiate the result. Those cases in which sugar is not influenced by dieting do badly as a rule.

Cases with albumin should be given a guarded prognosis, and one must expect a somewhat prolonged convalescence; but if the general health is good, albumin is not a contra-indication to operation.

Monocular Cataract.—When the cataract is monocular, no trace of lenticular opacity being found in the other eye, the cataractous eye must be most carefully examined for some associated disease (history of blow; signs of past or present iridocyclitis, keratitis punctata, etc.; signs of retino-choroiditis in either eye, or detachment of the retina with faulty projection; signs of glaucoma). Even if the eye be found otherwise healthy, it is only in exceptional cases that a monocular cataract should be operated on. (*See* Traumatic Cataract, *supra.*) *N.B.*—Monocular cataract associated with bad projection should always suggest the possibility of intra-ocular growth.

Double Cataract.—The degree of cataract is as a rule different in the two eyes. No operation should be undertaken while the vision of the better eye is $\frac{6}{12}$ or more. The only exception to this is if the more mature cataract is becoming *hyper-mature*, when the extraction may be performed earlier.

If one cataract is mature, or nearly mature, and if vision in the good eye has fallen below $\frac{6}{12}$, an operation should be done in the worse eye, so that this may be ready to be used as the vision of the other deteriorates. An operation done sooner is of little use, since an eye with $\frac{6}{12}$, with its lens *in situ*, is much more useful than even a $\frac{6}{6}$ eye, supplemented by a strong convex glass, but minus its lens.

Immature Cataract.—It is unnecessary to wait until maturity is reached; though mature cataracts are undoubtedly more easy to remove, and convalescence is less complicated, yet operations on immature cataracts, in patients older than fifty-five, as a rule do very well.

When both eyes are equally affected, and the cataract is immature, it is well to wait till vision has fallen to $\frac{6}{24}$ before operating. A preliminary iridectomy may be undertaken; it often hastens the maturing process, and renders the extraction less liable to complications.

Having indicated the methods of determining which cases are suitable and unsuitable for operation, we have now to consider *how we can help the patient till the time of operation has arrived.*

1. We prescribe those glasses which give the best vision. An over-correction for close work, combined with prisms with their bases in, is often of assistance. Bright illumination from a source placed behind the left shoulder should be used. A reasonable use of the eyes—short of causing discomfort or aching—is quite allowable.

2. If the cataract is chiefly nuclear, wearing of tinted glasses out of doors is of assistance, since they help to prevent the pupil contracting in a bright light. Weak atropine drops, gr. $\frac{1}{20}$ to $\frac{1}{10}$ to the oz., may be used once a day, just sufficient to dilate the pupil beyond the border of the opacity. In some cases, though unfortunately in very few, this is of great assistance. Care must be taken that the atropine—even though so weak—does not cause increase of tension.

3. The aching and discomfort often caused as the lens is swelling is sometimes relieved by alternate hot and cold bathing of the eyes, or by very weak atropine drops.

4. As mentioned above, in immature cataract in both eyes, a preliminary iridectomy may be performed to hasten maturation.

As regards the operation of extraction, see text-books on ophthalmology.

Management of a Case after Cataract Extraction.—The patient is kept in bed for a week, with strict nursing for at least four days, and is not allowed to sit up till the end of the fourth day. Both eyes are kept bandaged for three days. If the patient is

liable to hypostatic congestion of the lungs, he is allowed up sooner than a week, and to sit up in bed before the fourth day. If he has delusions, he should also be allowed to get up sooner, and the bandage should be taken off the unoperated eye at once.

Dressing.—The eye is dressed every day: warm boracic lotion is used to wash away any discharge from the lids, a little being allowed to pass into the conjunctival sac after the second day. The best dressing is a pad of cyanide Gamgee tissue. Great gentleness and strict antiseptic precautions are to be observed. No extensive examination of the wound should be made till at least the fourth day, if all is going well. The pupil must be kept well dilated with sterilized atropine drops or ointment (1 per cent), placed in the conjunctival sac once a day as a rule; but if the pupil remains contracted it must be used more frequently (*see below*, COMPLICATION, *Iritis*). At the end of the week, if the wound has healed, the anterior chamber has re-formed, and the eye is not injected, the bandage may be dispensed with during the day, and a pair of dark goggles worn. A pad and bandage should, however, be used at night for at least another week.

As to hobbling the patient's hands, it is well to tie a light bandage round the wrist at night on the same side as the operated eye, to prevent his knocking the eye in his sleep.

If all goes well, and the eye is free from redness, the patient may go out at the end of a fortnight; but care must be taken for at least a month to protect the eye from cold winds. Glasses are ordered six weeks after the operation.

Should *needling* be necessary, this should not be undertaken till two weeks after all redness has disappeared from the eye, but should not be postponed too late, lest the capsule lose its elasticity.

COMPLICATIONS.—1. *Suppuration.* If this occurs, the eye is in great danger of being lost, but eyes in which suppuration has begun have been saved by prompt and thorough action, viz., by washing out the anterior chamber and giving the appropriate vaccine. After an anæsthetic has been given, the aqueous humour is drawn off into a sterilized syringe, from which smear-preparations and cultures are subsequently made, the organism recognized and separated, and the vaccine prepared. Having drawn off the aqueous humour, the anterior chamber is washed out with sterilized normal saline. The infection being usually due to one of the staphylococci, a mixed staphylococcic vaccine is given at the time, till the patient's own vaccine can be prepared. The after-treatment consists in the application of atropine, leeching the temple, regulation of the bowels, and maintaining the general strength of the patient, combined with absolute rest in bed. Suppuration is best prevented by the strictest antiseptic precautions, and by refraining from operation in the presence of conjunctivitis or a mucocele.

2. *Iritis* should be treated by atropine, leeching, hot bathing, and purging; if the pupil does not dilate well, the atropine should be inserted three or four times a day (sterilized atropine ointment is more efficacious than drops) till good dilatation is obtained; protection of the eye must be maintained proportionately longer. Should atropine irritation occur, a substitute must be used. (*See* IRITIS.)

3. If the anterior chamber does not re-form, or if the wound does not properly flatten down, the use of the pad and bandage must be continued, and the patient kept in bed and at rest for a longer period.

4. Occasionally increased tension occurs. This, if due to cyclitis, must be treated as in 2. If due to entanglement of the capsule, weak eserine may be tried; division of capsule must not be attempted till other means have failed.

5. If the eye has not settled down in three weeks' time, and especially if the iris is muddy, the cornea hazy, and there is keratitis punctata, the danger of sympathetic ophthalmia must be considered, and a careful watch kept on the other eye. (*See also* OPHTHALMIA, SYMPATHETIC.)

6. In some cases of iridocyclitis following extraction of cataract, wonderful improvement has occurred after the administration of salvarsan—which can be repeated if necessary.

W. Tindall Lister

CATARRH, NASAL.—(*See* RHINITIS.)

CELLULITIS.—(*See* ERYSIPELAS.)

CEREBRAL ABSCESS.—Localized collections of pus within the cranial cavity may lie between the bone and dura mater (extradural abscess); between dura mater and pia arachnoid (meningo-cortical or subdural abscess); or within the brain substance (intracerebral or intracerebellar abscess). Any or all of these varieties may occur together, and the fact that intracerebral abscess is not infrequently multiple should never be forgotten. The micro-organisms concerned are most frequently the common pyogenic cocci; less often the *Pneumococcus*, *Bacillus pyocyaneus*, and *Bacillus typhosus* have been found. The commonest route of entrance is via diseased bone, and in this manner tuberculous and syphilitic caries of bone may cause intracranial abscess, but in such instances the abscess is due to the pyogenic organisms which have secondarily infected the diseased bone. Suppurative otitis media is by far the commonest cause. The chronic cases are more frequently complicated by abscess than the acute in the proportion of 9 to 1. Males are more often attacked than females, and the commonest age is from ten to thirty. In addition to bone disease, bronchiectasis and pyæmia are occasional causes. The actual modes of invasion are: direct extension via veins or perivascular lymphatics, hæmatogenous infection of a damaged portion of brain, embolism from some septic focus elsewhere, and direct infection by means of a penetrating wound. Many examples of this last-named class have resulted from gunshot wounds.

When an abscess arises in connection with bone disease, it is usually situated close to the position of the caries; so that in the ear cases it lies in the temporal lobe just above the tegmen tympani, or close to the anterior margin of the cerebellar hemisphere; in the nose cases, in the frontal lobe.

The cerebrum is affected more than twice as often as the cerebellum.

With intracerebral abscess, all degrees of acuteness and chronicity are met with, from a diffuse purulent encephalitis with no boundary but œdematous brain, down to the strictly localized cyst-like abscess with a thick dense capsule. The capsule varies in thickness, and bud-like extensions are common; such buds are apt to become cut off from the parent and form apparently separate and independent abscesses. These advances may occur after a period of latency, causing fresh symptoms; and rupture may occur into the ventricles, or into the subarachnoid space. In the otitic cases the intracerebral abscess is frequently only one of a number of septic complications, such as meningitis, extradural abscess, lateral sinus thrombosis, and pyæmia.

The clinical picture varies as much as the pathological condition. Several types may be recognized: (1) Extremely acute diffuse septic softening of the brain, with rapid onset of œdema, compression, coma, and death; (2) Latent cases, with few symptoms until death occurs suddenly from œdema cerebri, or rupture of the abscess (such abscesses have been known to evacuate themselves spontaneously through the ear); (3) Cases of moderate acuteness, with steady advance of symptoms; (4) Very chronic cases, with symptoms indistinguishable from those of cerebral or cerebellar tumour.

Symptoms.—The symptoms arise from: (1) Septic absorption; (2) Increased intracranial pressure; and (3) Disordered function of the part of the brain involved by the abscess. Whilst all three of these groups of symptoms may co-exist, they usually do so in varying proportions. Thus in the most acute cases the symptoms of toxæmia and increased intracranial pressure predominate, whilst in the chronic cases the localizing signs may be the most conspicuous.

Treatment.—Drainage of the abscess at the earliest possible moment is the only rational treatment. The cases reported as having recovered spontaneously represent merely pathological curiosities or diagnostic errors. The operation necessitates, as a first step, removal of the diseased bone from which the abscess has originated; and as the two are usually situated close together, this preliminary step opens up the natural and proper path for approaching the abscess.

Exploratory puncture with trocar and cannula is to be condemned on several grounds: the danger of carrying fresh infection into the brain substance; the improbability that the thick viscid pus will run along a cannula unless the latter be of very large size; the danger of passing the trocar through the abscess without detecting its presence; and the danger of pushing a thick-walled abscess away bodily, or causing a thinned-out advancing portion of its wall to rupture into the ventricle. If an exploration has to be made, it should be done by a clean incision with a sharp knife. The bony and dural openings must

be large enough to afford a good view of the cortex before the incision is made. As soon as the intracranial pressure diminishes, from evacuation of the pus, the brain falls away from the surface and opens up the subdural space, thus inviting the spread of pus over the meninges. In order to avert this accident, strips of gauze should be tucked in between the dura and brain before the incision is made, thus packing off and guarding the subarachnoid space—just as the peritoneal cavity is packed off before opening into an appendix abscess. An ordinary rubber tube, with lateral holes, can be made to serve for a drain, but the best form is a rigid tube of metal or celluloid perforated with a large number of small holes. Whichever kind is employed, a strip of gauze, to be changed frequently, should be passed down its lumen, which otherwise quickly becomes blocked by brain débris and thick pus. The tube should remain *in situ* for many days, or even weeks, as there is a great tendency for pus to re-accumulate in the deeper part if the tube is left out too soon. Protrusion of brain substance is apt to occur at first from œdema, but this, in the absence of meningitis, soon subsides. Fungus cerebri occurring at a later stage points either to imperfect drainage, spreading encephalitis, or meningitis. *Percy Sargent.*

CEREBRAL HÆMORRHAGE.—(*See* Apoplexy ; Hemiplegia.)

CEREBRAL IRRITATION.—The train of symptoms known by this name is due to a laceration or contusion of the frontal lobes. On recovering from concussion the condition of the patient becomes one of extreme mental irritability. Absolute rest and quiet are essential, and the patient should be disturbed as little as possible for the purpose of examination. It is undesirable that the patient should be forcibly fed by means of a nasal tube, and it should be remembered that often he may be persuaded to take food voluntarily, or will eat it if it be left by the side of the bed. Although the patient may have fairly recovered in two or three weeks, persistent mental weakness is not unlikely to remain ; prolonged rest should therefore be insisted upon. The withdrawal of 20 c.c. of cerebrospinal fluid by lumbar puncture has been recommended in these cases, and is said to cause alleviation of the symptoms of restlessness and excitement.

S. Maynard Smith.

CEREBRAL SYPHILIS.—(*See* Syphilis of the Nervous System.)

CEREBROSPINAL MENINGITIS.—(*See* Meningitis.)

CERVICAL RIB.—(*See* Nerves, Peripheral, Surgical Affections of.)

CHALAZION.—(*See* Eyelids, Diseases of.)

CHANCROID (Ulcus Molle).—The chancroid is a local contagious ulcer of the genital organs, is infective in nature, and usually considered to be due to inoculation with the streptobacillus of Ducrey. This form of venereal disease was formerly met with very frequently, but is nowadays an unusual occurrence. As these sores tend to spread locally with great rapidity, and early to infect the inguinal glands, the primary object of treatment is the destruction of the bacillus. To effect this, iodoform, or one of its equivalents (*see* Syphilis), may be applied after the sore has been carefully cleansed in warm water. But if the ulcerative process does not subside under this treatment, more strenuous measures must be adopted, consisting of application of carbolic acid, nitric acid, or Ricord's paste, composed of equal parts of sulphuric acid and finely powdered willow charcoal. By these means the infective process will be stopped, and the resulting ulcer may then be treated with antiseptic powders or lotions.

The chancroid is liable to be complicated by phimosis, a condition by which the multiplication of the sores is encouraged ; under these conditions, subpreputial irrigations with mild antiseptic lotions should be employed, and if this does not check the progress of the ulcers, free incision down the dorsum of the prepuce should be resorted to. The sores being exposed, they will subsequently yield to treatment by applications of iodoform or one of its substitutes ; they are usually too extensive to admit of treatment by any cauterizing agent.

Chancroidal bubo is a frequent concomitant of the chancroid, and is liable to proceed to suppuration should the bacillus of Ducrey be conveyed by the lymphatics to the

inguinal glands, the condition being then known as virulent bubo. This will not yield to palliative measures, but requires free opening, scraping, and the subsequent application of antiseptic dressings. With the object of averting this possible complication, the patient should be enjoined to abstain from muscular exercise, such as walking, riding, or dancing, and a simple diet with abstinence from alcoholic drinks is essential.

Ulcus molle serpiginosum is a much less common condition, in which the ulcer usually presents itself in the inguinal region, and spreads thence gradually up the abdominal wall, down the thigh, and inwards along the femoroscrotal furrow. It is most resistant to both local and general treatment, but may yield to large doses of the iodides internally, and the local application of iodoform or orthoform powder. *J. Ernest Lane.*

CHICKEN-POX.—(*See also* FEVERS, ACUTE INFECTIOUS.) This disease is usually of so trivial a nature as to require no treatment except confinement to bed until all the vesicles have become scabs. Irritation of the skin and itching will be relieved by sponging with tepid boracic lotion, or by moistening the skin with a 2 per cent solution of carbolic acid. The child should be prevented from picking the pocks ; if there be much eruption on the scalp, the hair should be cut short.

If the pocks become gangrenous, the constitutional symptoms may be severe. The sloughing pocks must be fomented with warm boracic lotion till the crusts have separated ; the ulcers that remain must be treated with a stimulating antiseptic lotion or ointment, and the patient put on a generous diet.

In the rare variety, varicella bullosa, the excoriations left by the ruptured bullæ require treatment with some such application as zinc or boracic ointment.

The patient may be considered to be free from infection when all the scabs have separated, or, in the case of V. gangrenosa, when the ulcers have healed.

Quarantine period : three weeks. *E. W. Goodall.*

CHILBLAINS.—The general and prophylactic treatment is the same as in RAYNAUD'S DISEASE (q.v.). Cod-liver oil, maltine, and tonics should be administered. A course of thyroid treatment is often beneficial, and so also is opium in small doses (e.g., liq. opii sedativus, 3 to 5 min., twice or three times daily). Locally, the following applications are useful :—

℞ Caustic Potash ½% | Alcohol āā 20%
Glycerin | Water 60%

The hands are bathed in warm water and the above rubbed in.

℞ A 30% ointment of ichthyol in lanolin or vaseline.

℞ Linimenti Aconiti | Olei Amygdalæ Amaræ ℥v
Linimenti Belladonnæ āā ʒiss | Linimenti Saponis q.s. ad ʒij
Tincturæ Opii ʒiij

½ to 1 dr. is applied to the painful part night and morning.

Another method consists in immersing the parts once or twice a day in warm water, with subsequent gentle friction with camphorated alcohol, and powdering with one part of salicylate of bismuth to nine parts of starch, or flexile collodion may be painted over the affected area.

The use of peroxide of hydrogen has also been strongly recommended. The patient bathes the affected parts in peroxide of hydrogen (10 vol.) diluted with equal parts of previously boiled water, still hot, for fifteen or twenty minutes twice a day. This treatment can be carried out even if the chilblains are cracked and ulcerated, though it is well to diminish the strength of the peroxide if much pain or irritation is produced by the application. Two or three days' treatment is usually sufficient. If there be much suppuration, chinosol fomentations (1–200 to 400) are useful, but if there be none, carron-oil dressings or a mixture of lanolin, vaseline, and almond oil in equal parts may be applied.

The administration of soluble salts of calcium has been recommended in order to increase the coagulability of the blood. The chloride or lactate may be given in doses of 10 to 15 gr. thrice daily, for two or three days at a time, flavoured with syrup of orange or fluid extract of liquorice. Very good results have been reported in some cases.

For electrical treatment, *see* ELECTROTHERAPEUTICS. *Robert Hutchison.*

CHLOROFORM OR POST-ANÆSTHETIC POISONING, DELAYED. — The accepted treatment of post-anæsthetic poisoning is based on the assumption that acid intoxication is the cause of the symptoms. Carbohydrates are recommended to supply the oxygen necessary for the conversion of fat, and alkalis to neutralize the fatty acids supposed to be present in excess, or to take the place of alkalis drained for a similar purpose from the tissues. As fatty acids are not highly toxic in themselves, it is believed by some that the symptoms are really due to diminished alkalinity of the blood and tissues. Benedikt, however, has found that the alkalinity of the blood may be far lower than it ever is in diabetic coma, without the occurrence of toxic symptoms.

Whatever may be the explanation, it seems certain that the alkaline treatment has been serviceable in a few cases of incipient diabetic coma with acidosis. This treatment should therefore be employed in post-anæsthetic intoxication: Drachm doses of citrate or bicarbonate of potash or soda should be given in three or four ounces of water every three hours per rectum, as fluids cannot be retained in the stomach. Half to one pint of normal saline solution should also be injected intravenously, and repeated if necessary twice daily.

A temporary rally is all that the writer has observed as the result of this treatment in severe cases. The same may be said of strychnine given subcutaneously, and of hemisine, $\frac{1}{100}$ gr., in the form of 'ophthalmic tabloids', placed in the conjunctiva or under the tongue. Restlessness, excitement, and delirium should be treated by bromides in $\frac{1}{2}$- to 1-drachm doses per rectum. On no account should morphia or chloral be given.

The Carbohydrate Treatment is suggested by the fact that under its use the acetone bodies speedily disappear from the urine in cases of diabetes. The theory that post-anæsthetic intoxication is simply a matter of carbohydrate starvation is against all clinical experience, yet carbohydrates as oxygen carriers may be of use. *Dextrose* in 10 to 20 per cent solution given per rectum, or in 6 per cent solution intravenously as suggested by Beddard, has been successful in at least one case.

The treatment of severe cases of post-anæsthetic intoxication is most unsatisfactory, but many mild cases of prolonged vomiting and acidosis recover under simple measures, such as giving ice to suck, or frequent sips of hot water, and applying hot fomentations to the epigastrium.

Prophylaxis.—There is reason for believing that the subjects of 'cyclical vomiting' are also potential victims to post-anæsthetic intoxication. A clear history of cyclical vomiting has been obtained in some cases. The chief danger seems to be in operating on patients just before, or during, an attack of acute acidosis. Operations after or in the intervals between attacks of cyclical vomiting seem to be free from danger. Operations, again, in cases of chronic acidosis have been performed without ill result. This seems to be further evidence that post-anæsthetic poisoning is not merely an acid intoxication, but a far graver form of toxæmia.

Caution should be exercised in performing any but urgent operations on children who are subject to cyclical vomiting. When excess in fats and carbohydrates has been habitual, a mixed diet, with restriction in those articles, should be prescribed for two or three weeks before an 'operation of expediency' is undertaken. The anæsthetic employed should always include oxygen. Chloroform alone is especially dangerous, and ether, ethyl chloride, and even nitrous oxide, are not safe. Perhaps A.C.E., or nitrous oxide with oxygen to follow, would be attended by least risk.

When with marked acidosis operations for conditions such as acute appendicitis appear urgent, one can only counsel delay so far as seems consistent with safety. (*See also* ACIDOSIS.)

Leonard G. Guthrie.

CHLOROSIS.—(*See* ANÆMIA.)

CHOLANGITIS.—(*See* BILE-DUCTS, CATARRH OF.)

CHOLECYSTITIS.—Inflammation of the gall-bladder may be catarrhal, suppurative, or phlegmonous.

Simple catarrh of the gall-bladder is frequently associated with that of the ducts, the catarrh commencing in the gall-bladder and spreading into the ducts, or vice versa. And the causes of the two affections are much the same—very commonly it is a gall-stone

in the gall-bladder, but perhaps more often than in catarrh of the ducts it arises from some general blood infection or some local abdominal lesion which leads to a microbic affection of the gall-bladder.

Treatment is as for catarrh of the biliary ducts (*see* BILE-DUCTS, CATARRH OF).

A peculiar form of inflammation of the gall-bladder sometimes occurs in which the catarrhal products result in coagula or partial or complete casts of the interior of the gall-bladder. This gives rise to spasmodic attacks of pain, resembling attacks of biliary colic, though on the whole of less severity. So much do they resemble biliary colic that the gall-bladder has been opened on a diagnosis of gall-stones.

The treatment is the same as that of chronic catarrh of the ducts, viz., by cholagogues and salines. Acetylsalicylic acid is spoken of as giving great relief during the attacks. If the affection be very persistent, it is best to open and drain the gall-bladder.

Suppurative and phlegmonous inflammations of the gall-bladder give rise to empyema of the gall-bladder or to sloughing of its walls; they occur sometimes from gall-stones, sometimes from a virulent microbic affection, as has occurred in some cases of typhoid fever.

The treatment is immediate operation, and drainage or excision of the gall-bladder.

Cholecystitis and choledochitis may become the starting-points of gall-stones, and any treatment which can check the inflammatory condition of the ducts in an early stage may have an important deterring effect on the formation of gall-stones. The possibility of draining bile from the common duct and liver by means of the duodenal tube has been known for some time. S. J. Meltzer, of the Rockefeller Institute, has shown that magnesium sulphate solutions placed in the duodenum, without first passing over the gastric mucosa, lead to pouring of bile out of the gall-bladder into the duodenum, whence the bile can be withdrawn from the body by the duodenal tube, and its examination by cultural and laboratory methods will give direct evidence of the condition of the gall-bladder. Treatment by such duodenal draining off of bile and disinfection of the gall-bladder and ducts will, it is claimed, frequently cure the cholecystitis and prevent formation of gall-stones.

Sidney Phillips.

CHOLELITHIASIS.—(*See* GALL-STONES.)

CHOLERA.—(*See also* SPECIFIC THERAPY.) During an epidemic great care must be taken in the treatment of all disorders of the alimentary system, as these in many cases predispose to attacks. Any diminution in the normal acidity of the gastric contents decreases the natural protection against this disease.

At the onset of the disease a brisk purgative is of value; calomel, castor oil, or castor oil and opium, are those most frequently used. When the disease is established, no powerful drugs must be given by the mouth in large quantities, as little absorption takes place from the stomach. Not only may such drugs be useless, but a portion may remain in the stomach to be absorbed during the period of reaction, and so prove injurious.

Intestinal antiseptics such as β-naphthol, izal, and salol have been frequently used, but without very beneficial results. Rogers uses permanganate of potassium or calcium to destroy the toxins in the intestine. He gives a solution of ½ to 1 gr. per pint, and rapidly increases the strength to 4 to 6 gr. if the patient will swallow it, and allows the patient to take this solution *ad libitum*; or he gives it as 2-gr. pills. More frequently the treatment is directed towards relieving the symptoms. Such mixtures as the following seem to give relief:—

℞ Acidi Sulphurici Diluti			Tincturæ Capsici	℥v
Chlorodyni	āā ℥xx		Aquam Menthæ Piperitæ	ad ℥j

Every two hours.

Hot applications to the abdomen, warmth, and rest as far as possible, must be enforced. Hypodermics of morphia, or inhalations of chloroform to relieve cramp, may be given.

In the collapse stage, heat is essential, and may be supplied by the use of warm blankets, and hot-water bottles to the feet, thighs, and axillæ. Injections of ether and strychnine may be required. Transfusion with normal saline solution sometimes produces

marked benefit, but this is often temporary, and though the transfusion may be repeated, its effect is then less marked. There is often a recurrence of the diarrhœa. Rogers' treatment by intravenous injection of hypertonic saline solution gives better results. The solution he uses is composed of 120 gr. sodium chloride, 6 gr. potassium chloride, and 4 gr. calcium chloride to 1 pint of sterile water. In a bad case of collapse, with a blood-pressure of 70 mm. of mercury or under, and a specific gravity of the blood of 1063, he gives 3 or 4 pints at a rate of not more than 4 oz. per minute ; both the rate and the amount depend on the variation in the blood-pressure. The injection should be repeated if the blood-pressure falls or symptoms of collapse recur. During the stage of reaction, treatment must be entirely symptomatic and not too active. *C. W. Daniels.*

CHORDEE.—(*See* GONORRHŒA.)

CHORDITIS TUBEROSA.—(*See* LARYNGITIS.)

CHOREA, ACUTE RHEUMATIC.—When considering treatment, it is necessary to take a broad view of the various factors, in addition to the rheumatic infection, that have a part in the causation of chorea. It is also useful to keep clearly in mind that for rheumatic chorea we have two outstanding indications for treatment. The first is the rheumatic process ; the second the nervous phenomena which arise from the result of the damage to the nervous system produced by this rheumatism.

Rheumatic children are often highly nervous, very sensitive, and lacking in reserve force. They frequently suffer from night terrors and headaches, and are easily upset by shocks and frights. A knowledge of this will sometimes enable us to anticipate an attack of chorea. Such warning symptoms as headache, dreaming of school work, fidgety movements, irritability, slight fever, and loss of mental and physical powers, call for active measures. All school work should be stopped, and the child be kept in bed, or at most allowed upon a couch in the afternoon, and later may rest in the fresh air. The bowels should be well opened, and only light food allowed. In this stage some believe that full doses of sodium salicylate or acetylsalicylic acid will cut short the illness, even if they are given when definite choreic symptoms have appeared. My experience leads me to believe that if good results are to follow from these drugs, it is under such circumstances. I prefer salicylate of sodium to acetylsalicylic acid, and when using it prefer having the child at complete rest. When chorea is severe or has been present for some weeks, I do not advocate pushing these drugs, for they do not seem to have any effect upon the illness.

Although rest is advisable in these mild cases of chorea, we are compelled to use our judgement as to the exact degree of restraint. Early signs of heart disease imperatively call for the utmost care, but where the heart escapes and the patient is unmanageable in bed, it may be essential and proper to relax the strictness of the 'rest cure'. Severe cases, the tests of which are the inability of the child to feed itself, to control its emotions, and above all to sleep, require most careful and skilful nursing. In order to prevent injury from the violence of the movements, the bed must be thoroughly padded, and although it is not permissible to use active restraint, a good nurse will certainly help the child by firmly tucking the clothes round it whenever it shows an inclination to sleep. Slight injuries and bedsores are difficult to prevent, for the skin becomes dry and unhealthy from the exhaustion of the child, and the incessant movements strongly dispose to their occurrence. If bedsores do arise, there is a peculiar liability to the supervention of septicæmia. The greatest quiet must be insisted upon, and isolation from other children, or even from everyone except competent and quiet nurses, may be called for. Here again we must use our judgement, always remembering that a child's mother may be by far the best companion, and that there is no magic in the term 'trained nurse'. The food should be fluid, nourishing, and abundant, and in exceptional cases nasal feeding is needful. Milk, eggs and milk, strong soups, and jellies are all indicated in these severe cases, and if large doses of hypnotics are being given, stimulants are of great service. It is in the cases of this severe type that the second indication for treatment becomes paramount. We are compelled to deal with the nervous phenomena, and I do not think at the present time we can do this by antirheumatic treatment, logical and desirable though this may be. For the

worst cases, the most valuable drugs, in my opinion, are chloral hydrate and bromide of potassium, and it is seldom that any decided signs of cardiac failure occur in children when treated with these. The chief difficulty lies in leaving off the chloral, for experience shows that, when it is omitted, there may be considerable nervous disturbance. This is most likely to arise when the physician has been alarmed by signs of collapse, and on this account has abruptly stopped the chloral. In most cases the difficulty can be overcome by cautiously diminishing the dose, and substituting occasionally a small dose of another hypnotic, such as barbitone.

Another admirable plan is the use of a hot pack given morning and evening. This is often followed by a refreshing sleep.

A considerable amount of judgement is required in the management of chloral and bromide. These drugs should be pushed sufficiently to produce drowsiness, but, whenever it is possible, the interval between any two doses should be increased, although on no account should the child be allowed to become very restless. For a child of seven years the following prescription can be given at the commencement :—

℞ Chloralis Hydratis gr. vij | Aquæ Chloroformi ℥ss
Potassii Bromidi gr. x |
Ft. mist. Mitte ℥vj. One tablespoonful every four hours.

The dose can be raised to 10 gr. of chloral hydrate, and such stimulant as is given should follow the medicine. Instructions should be given to the nurses to be on the watch for coldness of the extremities. Throughout the illness, the bowels, which are often obstinate, should be kept well opened. When the urgency is over and the child left exhausted by the illness, quiet is still imperative, and any inclination to sleep should be encouraged. A liberal diet should be allowed, and arsenic can now be given in an alkaline solution, thus :—

℞ Liquoris Arsenicalis ℥iij | Spiritus Chloroformi ℥vj
Sodii Bicarbonatis gr. vj | Aquæ Destillatæ q.s. ad ℥ss
Ft. mist. Mitte ℥vj. One tablespoonful three times a day after meals.

Later, massage should be commenced, and if the weather is suitable the child can soon be wheeled into the fresh air. Should it be noticed that, although the health appears to be restored, the movements remain choreiform, then passive exercises combined with suggestion are useful, and such toys and games as favour co-ordinate movements should be chosen. Lastly, when walking is permitted, Swedish exercises are indicated.

In many cases of moderate severity, one advises rest, feeding, and careful massage. The bowels are regulated by aperients, and no further medical treatment is needed.

Dr. Voelcker has obtained good results from trional given in doses of 5 gr. in cases of acute chorea, and I have certainly seen decided improvement in some very difficult cases ; yet it is also sometimes very disappointing.

Chloretone has been warmly advocated, but my experience has not been so decisive in its results as to enable me to be enthusiastic about this method. Like all the sedative measures, it does quiet the child, for it has a powerful action, even in 5-gr. doses, but many cases do not seem to get better any more quickly. Of this, too, I am convinced : you may with these doses get well-marked toxic symptoms, the direct result of the drug. The practitioner must be on guard for ataxy, slight double ptosis, mental apathy, and an extensive papular or erythematous rash.

A favourite drug in the treatment of chorea is arsenic. Some use it in ordinary doses, others commence with moderate doses, and rapidly push it to the limit of tolerance. Others commence at once with large doses, e.g., 10 to 15 min. of liquor arsenicalis. I never myself use arsenic in rheumatic chorea when the temperature is raised, and in severe cases it seems to me valuable time is lost by its routine employment. When there is no fever, and the nervous rather than the infective element predominates, arsenic sometimes produces marked improvement, and it is in this class of case that I use it. If it be decided to push the drug, its toxic symptoms must be remembered, such as vomiting, irritation of the eyelids, silvery tongue, looseness of the bowels, abdominal pain, and dermatitis. Three severe cases of neuritis have come under my observation, the results of the undue prolongation of this method of treatment. The dose at first is 5 min. of liquor arsenicalis

three times a day, and is raised drop by drop until 10 or even 15 are given. When the maximum is reached, it is maintained for a week, and then the treatment abandoned. As the dose of arsenic is increased, so must be the bulk of fluid in which it is prescribed, for it is the concentrated arsenical solutions that are especially liable to damage the digestion. A useful device is to give the drug in barley-water flavoured with lemon.

A very great number of drugs have been used in the treatment of chorea, as phenazone, ergot, conium, belladonna, strychnine, and quinine, but their success is very doubtful, and I am convinced that in a case of ordinary severity it is wiser to trust to the healing power of nature than to give a child large doses of powerful drugs. Throughout the illness a close watch must be kept for the onset of carditis.

Vaccine therapy, so far as I have as yet employed it, has not produced any good result, and in one case I am inclined to think it had some influence in increasing the severity of the movements, but any statements of value upon the treatment of chorea need the support of numerous and accurate observations.

The most recent methods of treatment advocated have been intrathecal. Goodman, insisting on the value of an autoserum, has used the blood serum of the choreic patient for intrathecal injection. After withdrawal of a rather larger quantity of cerebrospinal fluid, about 15 c.c. of the serum are injected. These injections may be repeated from one to four times. This method requires skill and care. Porter has advocated horse serum intrathecally, combined with the administration of arsphenamin. Lumbar puncture and the withdrawal of 5 to 10 c.c. of cerebrospinal fluid has occasionally been helpful. From a considerable experience in cases of moderate severity I do not advocate this treatment for them.

F. J. Poynton.

CHOREA, CHRONIC.—*Exercises* are prohibited in all acute cases of chorea. They are only of use when, although heart, pulse, temperature, appetite, and digestion are normal, all pains and aches have disappeared, and general health has seemed fully restored for some weeks, choreic movements still continue.

Such may be termed *residual* chorea. The movements have become habitual, and may be chronic if untreated, but usually soon yield to carefully graduated exercises. These should be of the simplest character at first. Taking and crowning the pieces arranged on a draught-board, or building houses with small wooden blocks, should be practised. Freehand drawing and writing large letters with coloured chalks on a blackboard; touching, at word of command, small coloured balls hung at varying heights by strings to a frame; aiming with a pointer at the different circles of a target: all are useful and easy exercises as a commencement. More difficult are building card houses and setting backgammon pegs in holes drilled in patterns into a board.

Threading needles, sewing, and writing in small text should be left to the last. Many other useful exercises can be taken from the kindergarten apparatus. The principle is, to keep those which require the greatest amount of precision and co-ordination until the easiest have been mastered. No exercise should be employed if it tire or bore the patient.

For slouching, clumsy gait, ungainly attitudes, humped shoulders, dropped chins, all of which are sometimes sequelæ of chorea, ordinary drills are essential. (*See also* Tics.)

Leonard G. Guthrie.

CHOREA GRAVIDARUM.—In the majority of cases the patient, with the exception of the fact that she has involuntary movements, goes through a normal pregnancy, has a normal labour, and brings forth a normal child. If the movements have not ceased before labour, they probably will do so during the next month or two.

The frequency with which spontaneous abortion occurs, and also the tendency to the occurrence of acute maniacal attacks, have been exaggerated. It is possible that abortion is more common in these cases than in pregnancy uncomplicated by chorea, and it is true that acute maniacal attacks do occur, by which the patient is worn out, but these grave cases are rare. Most attacks of emotional insanity, whether maniacal or melancholic, are transitory, and not of grave prognostic significance.

The treatment may be summed up briefly thus: Assure the patient that the probability is that she will have a normal labour and eventually recover. Endeavour to find out whether she has any source of worry. Make her sleep, give her plenty of nourishment,

and keep her in bed in a quiet room with good nursing until the movements cease. Good nursing is essential, otherwise bedsores will probably develop. In many of these cases the exciting cause is to be found in mental worry, anxiety, or some shock. Removal of the source of worry, e.g., dread of difficulty and danger in the approaching confinement, will often have a marked effect in improving her condition. Marriage, in cases of illegitimate pregnancy, is to be advised as a part of the treatment.

The patient must be made to take a liberal diet, containing a large proportion of carbohydrates; in fact, 'over-feeding' is necessary. If the patient refuses to take food —a rare occurrence—forced feeding must be resorted to. Dr. Cecil Wall has pointed out a most important fact in connection with the difficulty occasionally met with in getting these patients to take food, viz., that a dental ulcer may be present, due to the frequent movements of the tongue against a sharp tooth.

The patient *must* sleep. Light massage and 'nursing' are preferable to drugs as methods of inducing sleep. If sedatives are necessary, chloral hydrate or chloralamide, combined with alcohol, are the drugs most to be recommended. They need not be given in large doses as a rule, nor need they be frequently repeated. Iron is indicated in cases where there is anæmia. The value of arsenic is very doubtful. Acetylsalicylic acid seems to act as well in chorea gravidarum as it does in ordinary chorea. Induction of abortion is to be avoided if possible. Formerly this method of treatment was responsible for many deaths from sepsis, and even at the present time there is some danger of sepsis following induction of abortion, the constant movements of the patient rendering asepsis difficult to obtain, in spite of the most minute precautions. This method of treatment, if ever employed, must be reserved for the small percentage of cases in which emaciation, sleeplessness, and the violence of the movements are exhausting the patient's strength. As, however, in these more severe cases induction of abortion is not always followed by improvement, and always brings with it a new danger, it is not to be resorted to lightly.

Another method of treatment, advocated by Drs. Fothergill and Fletcher Shaw, is based on the theory that chorea of pregnancy is a manifestation of toxæmia. Dr. Fletcher Shaw's routine treatment is "to keep the patients quiet in bed, on a diet restricted entirely to milk, until the movements show signs of improvement, when the diet is very gradually increased, always returning to the milk if there is any increase of the symptoms. Elimination by the skin and kidneys is encouraged by administering a simple saline diaphoretic and diuretic mixture, and the bowels are kept well open by calomel and jalap". In more severe cases he gives a large dose of calomel, followed by an oil enema and simple enemata, a pint of saline solution per rectum every four hours, and thyroid extract 5 gr. by mouth four-hourly. He found that in twelve consecutive cases treated on these lines no hypnotic drugs were needed, natural sleep occurring generally on the second or third night.

H. Russell Andrews.

CHYLURIA.—(*See* FILARIASIS.)

CIRCUMCISION.—(*See* PHIMOSIS.)

CIRRHOSIS OF LIVER.—In the early stages of cirrhosis the symptoms may be but slight, and are frequently indistinguishable from symptoms due to associated perihepatitis or to the effects of alcohol upon the gastro-intestinal tract; in non-alcoholic cirrhosis the symptoms are few till quite late in the disease. Abstention from alcohol will often lessen the flatulence, retching, and indigestion, but it is impossible to keep such patients under close observation, and the craving for alcohol being usually a part of the disease, abstention from it is more often enjoined than observed; at any rate, it should be impressed upon the patients that alcohol is most injurious when taken little diluted, and when the stomach is empty. Cirrhosis is not always due to alcohol; it occurs in animals such as cows and cats; often no cause is to be discovered. Syphilis, congenital or acquired, may be the cause of many more cases of hepatitis and cirrhosis than has hitherto been suspected, more especially where there is abundant ascites; the liver is then lobulated, and perihepatitis usually marked. Alcohol, however, seems prejudicial in cirrhosis from any cause; so, too, are rich, irritating, or highly spiced foods, which often congest and enlarge the liver temporarily. Syphilitic cases often

improve greatly under treatment by mercurials and iodides ; experience is still required as to the value of salvarsan in these cases.

The best diet is said to be milk, but this dietary is impossible to carry out in men following an active occupation, who can only be advised to take plain and light food, and to drink water, or Vichy or Seltzer water, freely at meals.

The accompanying gastric catarrh is best treated by alkalis and bitters, the latter sometimes relieving the alcoholic craving. Abstention from alcohol and care in diet and mode of living may sometimes succeed in staying the progress of the earlier stages of the disease.

In the late stages, the cirrhotic process continues even after alcohol ceases to be taken, but nevertheless abstention from it should still be advised, as the contrary accelerates the disease. In these stages, the symptoms are due to obstruction in the portal circulation, to failure of liver function owing to destruction of hepatic cells, and often also to accompanying perihepatitis and advanced gastric catarrh.

The caution already given (*see* BILE-DUCTS, CATARRH OF) as to the administration of arsenical compounds is still more necessary in the case of persons with syphilitic cirrhosis ; in such cases their use is attended with danger of acute atrophy of liver or of toxic jaundice.

Diarrhœa may be checked by astringents and by opium, if necessary, but a laxity of the bowels lessens the tendency to ascites, and should not be abruptly stopped.

Constipation, on the other hand, must be dealt with gently, or intractable diarrhœa may come on. Small doses of calomel occasionally, and more frequently phosphate or sulphate of soda, are best.

Hæmatemesis and **Melæna** must be stayed by astringents and opium ; in hæmatemesis adrenalin is also useful ; but hæmatemesis may be repeated and profuse, and may fail to yield to any remedy. It is undesirable to operate on hæmorrhoids in advanced cirrhosis, the result being sometimes very profuse hæmatemesis.

Ascites is sometimes due to portal obstruction within the liver ; not infrequently perihepatitis produces or contributes to its causation. Diuretics, of which oleum copaibæ is one of the most useful, may lessen it ; iodide of potassium is also useful, especially in syphilitic subjects. Inunction with the linimentum hydrargyri seems to lessen it in some instances, but too often it persists. The fluid should then be drained off gradually by two or three Southey's tubes, which are preferable to the larger trochar and cannula. The abdomen, whether drained suddenly or gradually, usually rapidly refills at first ; but tapping must be resorted to again and again. It is true that the ascitic fluid seldom fails to reaccumulate ; but the tapping relieves discomfort and often enables the subject of it to continue at his work, which would be otherwise impossible. In some cases, after repeated tappings the ascites ceases. Tonics, including iron, are beneficial in helping absorption of ascitic fluid. Dickinson advocated great restriction of the amount of fluid taken. Local peritonitis, or sometimes hæmorrhage into the abdomen, may occur after tapping. When ascites persists after repeated tapping, operation has been practised, with the object generally of overcoming the obstruction to the return of blood through the portal circulation. Talma's operation consists in opening the abdominal cavity, the peritoneum over the liver and diaphragm is scraped or curetted, so as to set up adhesive inflammation, the surfaces are brought into contact by stitches, and an addition to the original operation is the inclusion also of the great omentum between the diaphragm and liver. Roberts, of Philadelphia, practises another operation, stitching the great omentum to the abdominal wall. Another operation consists in division of the portal vein and uniting its distal end to the ascending cava, thus diverting the blood from flowing through the liver. These operations have been attended with some measure of success. In many cases the ascites in cirrhosis is due to local perihepatitis, and mere breaking down of adhesions lessens it.

When grave toxæmic disorders begin in the late stage of cirrhosis, such as hæmorrhages from the skin and from mucous membranes other than those whose blood returns into the portal system, delirium, and typhoid conditions, little can be done except to tide patients over their most serious discomforts. *Sidney Phillips.*

CLAUSTROPHOBIA.—(*See* NEURASTHENIA ; PSYCHOTHERAPY.)

CLEFT PALATE.—The deficiency may be limited to the soft part, or may extend to the hard palate; but a cleft of the hard palate without a cleft of the soft palate is almost unknown as a congenital deformity. The extent to which the hard palate is involved is very variable; there may be merely a notch on its posterior border, representing the smallest deficiency, or there may be a complete cleft extending from behind forwards over the whole extent of the palate, and involving the alveolar margin in front. Between these two extremes, all possible variations in extent of involvement of the hard palate are found. The cleft may be unilateral or bilateral: that is, the palatal process of the superior maxilla on one side may have united with the nasal septum, but union between the two superior maxillæ has not occurred, and so a unilateral deficiency is the result; when both superior maxillæ fail to unite with the nasal septum and with one another, a bilateral deficiency is the result. These variations, however, are of developmental rather than of surgical interest. The relations of the premaxilla to the anterior portion of the cleft are variable in cases of complete cleft. No union may have occurred between the premaxilla and the alveolar borders of the superior maxillæ on either side, and so the premaxilla juts prominently forward in front of the jaw, attached to the forepart of the nasal septum. Or union may have occurred on one side, so that the premaxilla appears rotated at its free edge away from the cleft separating it from the opposite superior maxilla.

With all types of cleft palate, varieties of hare-lip may be associated. (*See* HARE-LIP). In cases of complete cleft of the palate, early closure of the hare-lip appears to exert an influence tending to reduce the width of the cleft spontaneously. In incomplete clefts of the palate, this influence is absent, and so the presence of a hare-lip has no bearing upon the surgical treatment of the former. The view that the preliminary closure of the lip prevented proper access to the palate during later operative treatment is no longer tenable. The surgical treatment of hare-lip and cleft palate are therefore separate and independent problems in every case except in the type of complete cleft already alluded to.

The disabilities attending the presence of a cleft palate are: (1) Disfigurement, especially marked in cases of complete cleft; (2) Impairment of deglutition; (3) An imperfect mode of respiration when the nasal and oral cavities are not shut off from one another; and (4) Imperfection of pronunciation. The aim of the surgeon, therefore, is not merely to close the cleft, but also to remedy as far as possible the functional disability that is associated with it. As a rule, all of these disabilities readily disappear when the closure of the cleft has been effected—except the last one, defect of speech. This constitutes a separate problem. Perfect anatomical restoration of the palate does not necessarily imply perfect restoration of speech. The degree of speech defect previous to operation cannot be correlated with a corresponding degree of structural defect in the palate. 'Cleft palate' speech is present as a congenital defect in some children who have no structural defect of the palate at all. Other cases with gross structural defects may have little imperfection of speech. Others, again, with only slight structural defects may have such a high degree of speech defect as to be almost unintelligible. It is not surprising, therefore, to find that in some cases in which the result of operation is anatomically good, the functional result is disappointingly poor; and vice versa, that with indifferent anatomical results, a quite disproportionate improvement in the speech has sometimes occurred. The theory that the speech defect partially depends upon the structural deficiency of the palate, and partially upon an associated lesion of the speech centres, affords some explanation of these anomalies. Education of the patient after operation plays an important part in improving the defects of pronunciation.

The most suitable age for operating, and the type of operation to be employed, are still matters for controversy. Those surgeons who delay until the patient is two or three years of age do so on the ground that the cleft becomes narrower during the growth of the child. This certainly occurs where the cleft is a complete one. But it does not do so to any appreciable extent in that type of incomplete cleft in which operative success is the most difficult to achieve—i.e., where the cleft involves the hinder two-thirds of the hard palate and is broader towards the anterior end. Their estimation of the right time for operation is further based upon the conclusion that the Langenbeck operation of paring the edges of the cleft is the method to be employed. That this method has not given universal satisfaction is suggested by the search for alternative methods, a search which has resulted in the evolution of the flap-sliding operation of Davies-Colley, the

hinged-flap operation of Arbuthnot Lane, and the bone-approximation operation of Brophy. These methods have this advantage in common, that they can all be performed as soon as the child is strong enough to stand the strain of operation, and they are most opportunely performed within the first six months of life. Obvious disfigurement, imperfect deglutition, and impaired modes of respiration are thus abolished at an early date, whilst the surgical advantage of performing an operation in the mouth before the teeth are erupted is secured. Further, the tendency to catarrhal disorders of the respiratory tract is diminished. If the operation is successful, the training of the child in a correct pronunciation can be undertaken from the earliest moment at which it commences to talk. The chief disadvantage of these methods is the greater severity of the operation, which has led to fatal results in a certain number of cases, whilst, if healing fails to occur, the successful performance of a secondary operation at a later date is rendered more difficult.

From a careful study of the end-results of all methods of operating, these facts emerge : that a high percentage of successes has been achieved by each method in the hands of various surgeons ; that the early results of most surgeons by any method are invariably poor. The conclusion is obvious that, for any operation, the road to success lies through the diligent attention to detail and technique of any one method ; and that success will not be achieved until the skill, which is the fruit of experience of that method, has been gained. As a personal experience, the writer has deliberately abandoned the use of Langenbeck's operation (in its entirety) and also of Brophy's operation, but with a full recognition of the fact that other surgeons have achieved considerable success by the use of these methods. His own use of the Lane flap-method for the hard palate, combined with the Langenbeck operation for the soft palate, appears to him to combine the best features of both operations and to avoid the disadvantages of either. The operation can be done at an early age, and, so far as the experience of the writer is concerned, has not been attended by any complications. The principal features of these various operations are as follows :—

1. **Arbuthnot Lane Flap Operation** (for the hard palate only).—As a preliminary,

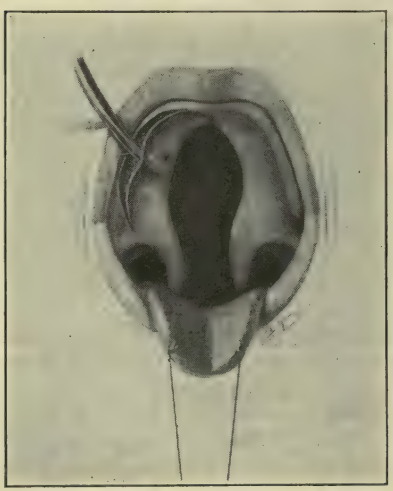


Fig. 5.—Flap being raised by special raspatory.

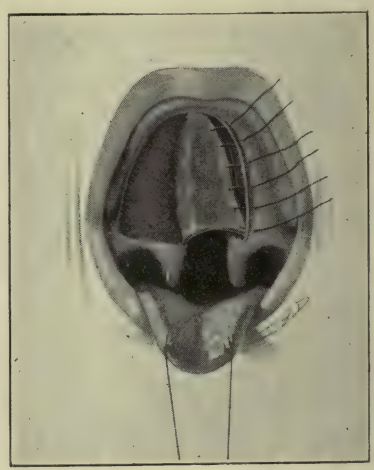


Fig. 6.—Mattress sutures in position.

the premaxilla must be restored to its normal position (*see* HARE-LIP) if the cleft is a complete one. The cleft then resembles the type shown in *Fig.* 5. In the actual case from which the sketches were made at the time of operation, the cleft was an incomplete one of the extent shown in the picture, without displacement of the premaxilla, and thus serves to illustrate the method of operation as applied to clefts of all sizes. From one side of the palate the mucoperiosteum is raised as a flap, which is then hinged on its mesial border across the cleft. In cutting the flap, particular care must be paid to designing it of such a size that it will easily bridge the cleft without tension, and in all cases the posterior

palatine artery, which enters just behind and internal to the site of the last molar tooth, must be preserved in its pedicle. With these precautions, no sloughing of the flap has occurred in any case under the writer's care. The free margin of the mucoperiosteum on the opposite side of the cleft is then undermined and raised to receive the free edge of the flap. Apposition is secured by mattress sutures of fine silkworm gut, which are first inserted through the epithelialized surface of the flap and then through the raw surface of the raised mucoperiosteum of the other side (*Fig.* 6), emerging at some distance from its free edge. If these have been properly inserted, raw surfaces of about a quarter of an inch breadth on both sides should be held in firm contact with each other. The free edge of the superior surface is then firmly united to the raw surface of the flap by a continuous suture along its whole length (*Fig.* 7). This continuous suture is of great advantage in helping to secure firm union and healing.



Fig. 7.—Mattress sutures tied; continuous suture inserted.

An interval of about two months is allowed to elapse before the second stage of the operation on the soft palate is undertaken by the Langenbeck method. By this time the hard palate should be firmly healed and capable of manipulation for effecting a junction with the soft palate. The soft palate is split at its free edges, so that no tissue at all is removed, by means of a small scalpel or a sharp tenotome (*Fig.* 8). Guide sutures inserted at the apex of each portion serve to steady it in position while this is being done. The palate on each side is then cut away by means of curved intranasal scissors from its attachment posteriorly to the hinder margin of the palatal process of the palate bone. This serves to render easy the approximation of the raw surfaces, and to temporarily paralyze the action of the tensor and levator palati muscles. Again the use of the continuous suture is of great value in obtaining firm union. The material used is ophthalmic D silkworm gut, threaded upon Lane's finest curved cleft-palate needles. Two layers are inserted, somewhat in the manner used for effecting an intestinal anastomosis. The posterior margins of the free surfaces are first of all approximated by a continuous



Fig. 8.—Edges being pared.



Fig. 9.—Posterior continuous suture inserted.



Fig. 10.—Anterior continuous suture inserted.

suture that passes between the posterior surface of the palate and the raw surface (*Fig.* 9). A second suture passing from the raw surfaces to the anterior surface of the palate then completes the union (*Fig.* 10).

In *Fig.* 11 the condition of the palate is shown at the completion of the second operation. At the junction of the hard and soft palate small openings may appear in some cases. Where very small, they tend to disappear spontaneously; but, if necessary, they may be closed by freshening the edges and drawing them together with a purse-string suture.

During the operation, a sandbag is placed under the child's shoulders, so that the head slopes backwards and downwards, enabling the blood to trickle towards the nostrils and away from the larynx. A silk suture is passed through the apex of the tongue to act as a retractor, and the jaws are propped open by means of Lane's cleft-palate gags or by a modified O'Dwyer's gag with small metal spikes inserted into the mouth-pieces. All suturing is done with black-stained ophthalmic D silkworm gut, threaded on Lane's cleft-palate needles held in his special needle-holder. The sutures are left in position until they drop out. At the end of the operation the palate is varnished over with a modified Whitehead's varnish (the spirit and iodoform are omitted from the original formula).



Fig. 11.—Completed operation at the end of both stages.

A mixture of oxygen and chloroform makes the most satisfactory anæsthetic, although open ether can be administered for these cases by a very expert anæsthetist.

2. **Langenbeck's Operation** (for the hard and soft palate combined).—The edges of the cleft are pared by a fine scalpel, with the minimum removal of tissue, over their whole length. Close to the alveolar margin of the jaw small incisions are made parallel to the cleft, through the mucoperiosteum of the hard palate, care being taken to avoid the site of the posterior palatine artery. These incisions serve not only to relieve tension upon the line of union after the sutures have been inserted, but permit the introduction of a small raspatory beneath the mucoperiosteum, which is then gently detached from the hard palate as far inwards as the sides of the cleft. The edges are then brought together by means of interrupted stitches of medium silkworm gut, which are inserted at some distance from the raw margins. A small piece of tape may be passed from one lateral incision beneath the raised mucoperiosteum of both sides, and then, emerging through the lateral incision of the opposite side, be tied so as to relieve tension on the raw edges. The opposed edges of the soft palate are similarly approximated by interrupted sutures.

3. **Brophy's Operation.**—This is best performed during the first six weeks of life. The two superior maxillæ are forcibly drawn together by means of silver wires passed through them, until the edges of the cleft are almost in contact. These are then freshened and sutured in the ordinary way.

The bone is transfixed through the gum, at a level above the palatal process and just behind the malar process, by a special stout needle carrying a pilot suture of thick silk. The needle is withdrawn, leaving the loop of the suture hanging free in the cleft of the palate, and the process is then repeated on the opposite side. The two loops of silk are then engaged, and one of them is withdrawn, so that the other is carried across the cleft and emerges through the hole in the opposite maxillary bone. Silver wire is then hooked on to this thread, and by reversing the pull, the wire is made to occupy the position of the thread. Two more wires are similarly inserted through the jaw in front of this one, and they are finally secured in position by passing through holes drilled in small metallic plates placed upon the outer surface of the gum on either side. The wires are then twisted together with sufficient tightness to approximate the bony portions of the palate. Severe osteitis, and even death, have resulted from this procedure; but undeniable successes have been achieved, especially in the hands of Brophy.

After-treatment.—If hæmorrhage should occur after any operation upon a cleft palate, an anæsthetic must be given and the bleeding point sought for. If the bleeding is coming from a bony foramen, simple pressure with a hard instrument to occlude the opening generally suffices, or the opening may be plugged by Horsley's aseptic wax. For general oozing, the local application of a strong solution of chloride of calcium is most valuable. The child must be kept quiet and prevented from crying by skilful nursing, eked out by the use of opiates when necessary. No local treatment to the palate is needed. Syringing

and spraying must always be avoided, since they induce coughing and crying, which are a menace to the line of union. The use of a mixture of chlorate of potash and salicylate of soda as a four-hourly medicine helps to ensure a cleanly condition of the mouth. In older children, a mild antiseptic mouth-wash after food may be of value. Only fluid food must be given for ten days after operation. This should have been sterilized previously, and must then be administered from sterilized receptacles. Infants must be spoon fed, and they should have been accustomed to this prior to operation.

The palate should not be examined until at least a week from the date of operation. Harm may be done by the resentment aroused by the examination of a palate that is healing successfully; whilst if it is not healing, no local measures are of any value in averting the break-down of the wound. Should septic infection have occurred, its onset will be heralded by a rise of temperature; but this is an exceedingly rare complication. The stitches are left *in situ* until they drop out. They may often be picked off the surface of the palate a few months after the operation. *George E. Waugh.*

CLIMACTERIC.—(*See* MENOPAUSE.)

CLIMATIC TREATMENT.—(*See* HEALTH RESORTS.)

CLUB-FOOT.—(*See* TALIPES.)

COCAINE HABIT.—(*See* DRUG HABIT.)

CŒLIAC DISEASE.—By cœliac disease one means that rare form of chronic intestinal disturbance met with in children after the first year, and characterized by large, pale, and offensive motions, with wasting and arrest of growth. It runs an extremely chronic course, and its pathology is still in dispute.

In such a case dietetic treatment is of the first importance. Fats and starches are ill-borne, and the main constituents of the dish should be proteins, gelatin, and dextrins. Ordinary milk is quite unsuitable, though fully peptonized or half-cream dried milk in moderate quantity sometimes agrees. Malted milk is perhaps better. The main food should be raw or much underdone scraped meat, of which as much as six ounces may be given in the day, mixed with a little broth. Fresh raw meat-juice may also be given freely with advantage. It is best made by being squeezed out of the meat with a meat press (e.g. the 'Hercules' meat-juice press).

Jellies of all sorts are suitable, and dextrins may be given in the form of Mellin's food biscuits, malted rusks, and breakfast biscuits. In order to prevent scurvy appearing as a complication—a real danger—some fruit-juice or the juice of fresh boiled vegetables should be included in the dietary.

A diet on these lines may have to be continued for an indefinite period, but from time to time one should try cautiously the effect of relaxing it slightly by the inclusion of a little milk or some easily digested form of starch such as well-boiled rice, being guided by the result on the stools; so long as these continue pale, however, fats are not likely to agree, though bacon fat is the least dangerous.

As regards general treatment, great care must be taken to avoid chill. The legs and feet should be warmly covered, and a flannel binder worn, and the possibility of chills during bathing carefully guarded against.

Drugs play a minor part in treatment; but if the tongue is clean and the stools are very offensive, opium is useful, the dose being about 1 min. of the tincture for each year of age, three times daily. Small doses of castor oil (5 to 10 min.) emulsified with mucilage, and with or without the addition of 2 or 3 gr. of salol, are also helpful, especially when the motions contain mucus. Nitrate of silver is also of benefit in certain cases, but for the indications for its use the article on DIARRHŒA, INFANTILE, should be consulted. In some cases, and especially if the stools contain undigested fat, an active preparation of the pancreatic ferments may be given with advantage, though it must be confessed that they often prove disappointing.

Finally, the great tendency of this disease to relapse, even when all seems to be going well, should be borne in mind; these relapses are not necessarily due to any error or omission in the treatment. With care and perseverance, however, a majority of the cases recover, even although treatment has to extend over a period of years. *Robert Hutchison.*

COLD IN THE HEAD.—(*See* RHINITIS, ACUTE.)

COLIC (in Adults).—It is important to exclude other more severe abdominal conditions, such as intestinal obstruction, before starting to treat a case as one of colic only. If this has been done, the treatment in an acute attack consists in putting the patient to bed with a hot-water bag over the abdomen and giving a full dose of castor oil with the addition of 10 min. tincture of opium, or administering a warm enema of soap and water.

In persistent or recurrent colic, care should be taken to exclude the possibility of lead poisoning (*see* PLUMBISM) or of organic obstruction. In the absence of these the treatment is to regulate the diet on the same lines as have been laid down for CHRONIC DIARRHŒA (q.v.), all raw fruits and green vegetables, together with anything that may irritate the bowel, being eliminated. A regular daily action of the bowels should be ensured by the administration of mild laxatives such as paraffin, cascara, or senna, and intestinal flatulence should be dealt with by carminatives (*see* FLATULENCE). Belladonna ($\frac{1}{2}$ gr. of the extract in pill night and morning) is also a useful remedy. Opiates should be reserved for severe attacks; chlorodyne in 10-min. doses is one of the best. Patients subject to colic should wear an abdominal belt to guard against chill, and should take care to keep the legs and feet warm.

Robert Hutchison.

COLIC (in Children).—In children flatulent colic occurring as a consequence of indigestion and fermentation of food is a common complaint. In hand-fed babies it may be due to over-feeding, to an inappropriate dietary, to want of cleanliness of the feeding-bottle, or to a chill setting up gastric catarrh; indeed, catarrh of the stomach is rarely absent, either as cause or effect. All these matters must be attended to, of course, without delay.

In children of all ages a very obstinate form of colic may be induced by the presence of a chronic post-nasal catarrh. This condition is accompanied by a copious secretion of mucus from the upper part of the nasopharynx. This is not only acrid and irritating in itself, but swarms with organisms and may be highly septic. The secretion trickles down the fauces and is swallowed by the patient. By this means a septic decomposition of the food is excited in the stomach, which leads to the formation of many noxious elements. These toxins may become absorbed into the system and be later the cause of widespread mischief; but an early consequence is often seen in attacks of severe colicky pain which may resist treatment with some obstinacy unless the throat condition be attended to.

In most cases of colic the attack of pain may be arrested by a copious enema of hot water (95°–100°) slowly injected into the bowel, or by ten to twenty drops of spirits of nitrous ether in a spoonful of water given by the mouth. The effect of the draught is to produce a discharge of flatus, followed by a copious flow of urine, and the pain ceases. Hot applications to the belly externally also help in promoting a dispersion of the wind. To prevent its recurrence, a dose of castor oil, or rhubarb and soda, should be given to clear away fermenting matters from the bowel. When this has acted the child may begin to take an antiseptic with carminatives. Thus for an infant of six months old:—

℞	Resorcini	gr. ij	Tincturæ Cardamomi Co.	℥v
	Spiritus Ammoniæ Aromatici		Aquæ Carui	q.s. ad ℥xxx
	Spiritus Chloroformi	āā ℥ss		

To be given every three hours.

A more obstinate form of colic which resists most antiflatulent remedies is sometimes met with in infants, both nursed and hand-fed. In nursing babies it is the consequence of the milk being too rich in protein. In this case the child shrieks with pain directly he has taken the breast. It is cured by giving the infant one or two ounces of fresh barley-water just before nursing, so that the milk is diluted as it reaches the stomach. If the attacks are only lessened and not cured by this means, $\frac{1}{30}$ gr. of codeina, given two or three times a day, rarely fails of its effect. It may be ordered with

℞	Resorcini	gr. ij	Glycerini	℥x
	Sodii Bicarbonatis	gr. j	Aquæ Anethi	q.s. ad ℥xxx

In hand-fed babies the same treatment may be adopted and the milk peptonized; or we may add citrate of soda to each bottle in the proportion of one grain to each ounce of the milk. It must not be forgotten in these cases to introduce a sufficient variety into the dietary, giving at least two differently flavoured foods alternately in the day, and providing a third for the night; also to see that the feet and legs of the child are kept warm. Cold feet alone may be a cause of colicky pains. Very obstinate cases are sometimes met with which resist even these measures. In one such case the infant was eventually cured by inunctions of mercurial ointment ordered as a last resource. The child had shown no signs of a syphilitic taint, and except for the abdominal derangement seemed to be perfectly healthy.

Older children are sometimes subject to attacks of severe abdominal cramp coming on repeatedly in the day and persisting for a week or more at a time. In the actual attack relief may usually be obtained by a rectal injection of one pint of hot barley-water containing half an ounce of oil of turpentine. To prevent a repetition of the pains every attention must be paid to the warmth of the feet and the avoidance of chill. The dietary must be revised, limiting the quantity of fermentable food, such as starches and sweets; and a mild aperient must be given to clear away undigested matters from the bowels. A useful remedy in these cases is:—

℞ Olei Terebinthinæ	℥iv	Glycerini	
Olei Ricini	℥viij	Mucilaginis	āā ℥xv
		Aquæ Menthæ Piperitæ	q.s. ad ℨij

Given every three hours (for a child six years old).

The mixture acts upon the bowels and stimulates the urinary secretion.

If there be much tympanites the turpentine may be combined with codeina and nitrous ether:—

℞ Olei Terebinthinæ	℥v	Glycerini	℥xv
Spiritus Ætheris Nitrosi	℥xx	Aquæ Menthæ Piperitæ	q.s. ad ℨss
Codeinæ	gr. $\frac{1}{10}$		

To be taken every four hours.

At the same time it is advisable to lessen the quantity of milk allowed as food, and to give in preference pounded fish, mutton or chicken, rusk or toast buttered cold, etc.

In all obstinate cases, whatever be the age of the patient, it should never be forgotten to ascertain the presence or absence of post-nasal catarrh. This is especially important if the patient respond but sluggishly to the treatment. If the pharyngeal mucous membrane be noticed to be thick-looking, vividly red, and glistening with mucus, measures should be adopted without any delay to remedy this state of things, for a colic induced by a septic fermentation in the alimentary canal is often difficult of cure, or, if arrested, very prone to relapse, as long as the introduction into the stomach of tainted mucus continues.

The colic which sometimes arises from an overloaded bowel can be distinguished by palpation of the belly, when the fæcal masses may be felt as hard superficial lumps studding the course of the colon. Sometimes they can be indented by firm pressure with the fingers. To clear these away a full dose of calomel should be ordered, to be followed after a few hours by a saline aperient; and the latter may be repeated every three hours or so until a sufficient effect is produced. The calomel has a marked influence in softening the fæcal masses, but in cases of long standing it may be necessary to use purgative injections, and even to break up the hard lumps in the rectum by mechanical means, before they can be expelled. (*See* CONSTIPATION.)

The colicky pains which precede a stool in cases of lienteric diarrhœa are treated of elsewhere. (*See* DIARRHŒA, INFANTILE.)

Eustace Smith.
(*Revised by R. Hutchison.*)

COLITIS.—(*See also* DYSENTERY.)

Catarrhal Colitis (Acute).—Acute or simple colitis is a catarrhal inflammation of the colon comparable to bronchitis or urethritis. There is usually persistent diarrhœa, which comes on suddenly, without apparent cause, accompanied by vomiting, pain in the abdomen, cramp in the calves of the legs, and signs of collapse. The distinctive character of the stools is that they contain much mucus and usually bright-red blood. There may

be a little elevation of temperature, but this is by no means constant. The following treatment may be adopted :—

1. The patient should be put to bed at once between hot blankets, hot fomentations should be applied to the abdomen, and hot bottles to the feet.

2. Gentle manual friction to the walls of the abdomen, the calves, and the thighs, will be found beneficial.

3. To a tumblerful of cold fresh cow's milk two tablespoonfuls of old liqueur brandy or old pot-still whisky should be added, and this should be sipped slowly.

4. A saturated solution of camphor in alcohol should be given in 3-min. doses every ten minutes for an hour, and subsequently hourly for six hours.

These measures will usually be found efficacious, but should they fail, and especially if the presence of an irritant in the intestines is suspected, a tablespoonful of castor oil should be given, followed in two hours by 20 min. of tinctura chloroformi et morphinæ composita.

Other remedies which may be found useful are :—

1. Perchloride of mercury, $\frac{1}{2}$ gr. in 6 oz. of water, a drachm every ten minutes for an hour, and then hourly.

2. Grey powder, $\frac{1}{3}$ gr. every hour for twenty-four hours.

3. An enema of laudanum, 15 min. in an ounce of mucilage of starch at a temperature of 100° F. The dose should be smaller for children, not more than a drop of the tincture of opium for every year of the child's age.

4. Pulvis kino compositus, 10 gr. three times a day, with tincture of capsicum 3 min.

5. A hypodermic injection of morphine, $\frac{1}{3}$ gr.

Attention must be paid to dietary, and a selection may be made from the following: (1) Barley-water ; (2) White of egg flavoured with lemon-juice ; (3) Whey, preferably white-wine whey ; (4) Milk, with one-third lime-water, or peptonized.

For the treatment of colitis in children, *see* Diarrhœa, Infantile.

Mucous or Mucomembranous Colitis.—This variety of colitis is peculiarly obstinate and difficult to treat. At the outset it is important to make as complete a diagnosis as possible, and to remember that 'mucous colitis' may be merely a symptom of organic disease of the colon, such as carcinoma, or result from the pressure of tumours or partial obstruction by adhesions, etc. It is therefore always advisable to make a pelvic examination and, in many cases, to employ the sigmoidoscope, before beginning treatment. It must also be remembered that in many cases the disease is accompanied by a greater or less degree of visceroptosis (q.v.), and that, in almost all, there is an underlying condition of neurasthenia which will require treatment on the usual lines (*see* Neurasthenia).

In all severe cases it is advisable to begin treatment with the patient in bed. Pain, which is due to enterospasm, should be relieved by hot fomentations to the abdomen, and by the injection of warm olive oil (4 to 6 oz.) into the bowel at night. This may be followed by a plain douche of normal saline next morning.

As regards diet, two plans are advocated : (1) One which is as bland and unirritating as possible ; (2) A bulky diet, rich in fat and cellulose, such as is useful in ordinary cases of constipation.

1. The former plan is that chiefly used in France, and is preferred by the writer. It consists of lightly-cooked eggs, pounded meat or fish, mashed potato, toast, rusks or biscuits, macaroni, vermicelli, and the other Italian pastes, purée of apple or prunes, and milk in small amount. All coarse and indigestible articles are forbidden, and no raw fruit or green vegetables are allowed, except perhaps purée of spinach.

2. The coarse diet, recommended especially by von Noorden, proceeds on diametrically opposite lines, and contains the coarsest whole-meal bread, and plenty of green vegetables, well-boiled and mashed with butter, in addition to pounded meats and much cream and butter.

After a fortnight or so of the above treatment, the patient may begin to get about, continuing the same diet ; but he should lie down for at least an hour after the mid-day meal. The injections should be discontinued and the patient encouraged to do as far as possible without aperients. It is rare, however, to find that these can be dispensed with altogether, but they should be of the least irritating kind. Castor oil (at bedtime or on first waking in the morning), the infusion of senna-pods, regulin, phenolphthalein (purgen,

laxoin, etc.), or, in the milder cases, liquid paraffin (half an ounce on an empty stomach twice daily) are the most suitable, the dose being regulated according to requirements. Salines and aloetic preparations should be avoided. In some cases a daily enema of plain warm water is sufficient. If there be any pain in the colon (enterospasm), belladonna should be given in addition (e.g., gr. $\frac{1}{2}$ of the extract, in pill, night and morning). Any tendency to dropping of the organs should be met by the use of a support (e.g., Curtis's), and abdominal exercises are often beneficial; but massage is usually injurious, especially if there be any pain.

The morbid mental condition which these patients often exhibit is difficult to combat, but they should be encouraged to live a normal life and to interest themselves in outside things (*see* PSYCHOTHERAPY). Bromides are useful from time to time for nervousness or irritability, but strychnine is best avoided.

In some cases a course of treatment at a spa is useful. Plombières and Châtel-Guyon have both a high reputation, and many patients now go to Harrogate in this country, where the 'ascending douches' which are an essential part of the French treatment are well carried out. Care must be taken, however, not to overdo the treatment by douching, although as an occasional measure it is helpful in cleansing the colon in the more chronic cases. Intestinal antiseptics, though often employed in this form of colitis, are disappointing in their results. Capsules of cyllin or kerol, or tablets of β-naphthol, are the best forms to employ. Soured milk gives good results in a few cases, but very often it fails to produce benefit. Surgical treatment is of little help in uncomplicated mucomembranous colitis. Ileosigmoidostomy alone is never to be recommended, and resection of part of the colon is a severe measure which is but rarely to be advised.

Ulcerative Colitis.—The treatment of the dysenteric form of ulcerative colitis is that of DYSENTERY (q.v.). The non-dysenteric form is best treated by appendicostomy, which should not be too long delayed. If operation is contra-indicated or refused, the patient should be kept in bed on a bland diet, and the colon gently irrigated night and morning with 2 pints of a 1–5000 solution of permanganate of potash. Bismuth should be administered by the mouth in doses of 20 gr. three times daily, and a little opium added if there is much pain. (*See* COLITIS, SURGICAL TREATMENT OF.) *Robert Hutchison.*

COLITIS, SURGICAL TREATMENT OF.—The symptoms usually described as chronic mucous colitis may result from a great many abnormal conditions of the colon; in fact any irritative lesion of the colon may cause such symptoms. It is most important to realize this, as our first aim and object is to find the cause of the symptoms and if possible to correct it.

The cause may be a chronic inflammation of the mucous membrane of the colon, either in its whole length, or more usually in part. It may be a chronically inflamed appendix which is constantly discharging septic material into the colon. It may be that there are adhesions, the result of some previous inflammatory mischief, binding down or kinking the bowel. The cause may be cancer of some part of the colon, the presence of some tumour pressing upon the colon, enteroptosis of the transverse colon, multiple polypi, or other similar conditions.

The first essential of treatment is a careful examination, if necessary under an anæsthetic. The abdomen must be carefully palpated, and the pelvis examined bimanually with one finger in the rectum. The most important examination is that of the higher part of the rectum and the sigmoid flexure with the electric sigmoidoscope. If any inflammatory condition of the mucous membrane be present, it will almost certainly be seen in the sigmoid flexure, and in many cases it is confined to this portion of the colon. The stools should also be carefully examined both macroscopically and microscopically.

In those cases in which, after a careful examination, a definite cause for the symptoms cannot be discovered, and in which a course of medical treatment has failed to give permanent relief, the advisability of an exploratory laparotomy should be carefully considered. The severity of the symptoms and the amount of incapacity for the ordinary affairs of life must be the determining factors in advising operation, as chronic colitis does not threaten the patient's life, except when ulceration is present.

If there is a local cause for the symptoms, such as adhesions, a tumour, or a chronically inflamed appendix, this will have to be dealt with according to circumstances. In those

cases where there is a chronic inflammation of the mucous membrane of the colon which will not yield to medical treatment, the choice of operation lies between a right-sided colotomy and appendicostomy. Very good results have followed giving rest to the colon by means of a right lumbar or right inguinal *colotomy*, but owing to the liquid character of the fæcal material coming from the colotomy opening, there are serious objections to this procedure. *Appendicostomy* is a much better operation in these cases, and does not cause the patient any inconvenience. This operation consists in bringing the appendix out through a small incision in the right iliac fossa and stitching it to the skin. A few days later the end of the appendix is cut off, and the colon is then irrigated daily by passing a rubber catheter through the stump of the appendix into the cæcum and allowing water, or some other suitable fluid, to flow into the colon from a funnel attached to the catheter. When the catheter is removed, the small opening of the appendix is both gas- and water-tight, and causes the patient no inconvenience. This operation is practically free from any risk, and has given very satisfactory results in these cases. It should be very seriously considered in those cases of chronic colitis due to inflammation of the mucosa which do not yield to medical treatment.

Chronic Ulcerative Colitis.—This is a much more serious condition, and many of the cases end fatally, either from progressive wasting or from perforation and peritonitis. Surgical treatment in these cases, if it is to be successful, must be carried out in the early stages of the disease, and not used simply as a last resort when the patient is almost dying. The indications here are to keep the colon clean and free from fæces and the products of inflammatory and putrefactive processes. This can be done either by performing appendicostomy, which enables the colon to be washed out frequently, or by entirely deflecting the fæcal current by means of a right-sided colotomy. Appendicostomy is by far the best operation, and the results have been so excellent that there should be no hesitation in advising it directly ulcerative colitis is diagnosed. Although recovery will sometimes occur without operation, it is so tedious a process in such circumstances that most patients will much prefer the latter. Right-sided colotomy is only indicated in cases where appendicostomy fails to cause any improvement. The operation must be done as early as possible, and the opening should in all cases be preserved for some months, until all traces of blood and pus have disappeared from the stools, as tested by microscopical examination. The results of appendicostomy in the treatment of ulcerative colitis have been excellent; the mortality from this disease ten years ago was about 50 per cent, whereas now in the cases treated by appendicostomy the mortality has been reduced to under 5 per cent. Appendicostomy should be the routine treatment in all cases of ulcerative colitis, and the operation should be performed as early as possible. Right-sided colotomy should never be performed for this condition unless appendicostomy has failed and the patient is losing ground; it will but seldom succeed if appendicostomy has failed.

If a right-sided colotomy is performed, the opening will have to be closed later by a plastic operation. If an appendicostomy has been done, an operation to close the opening will not be necessary. The patient should continue to irrigate the colon daily with warm water, and this should be continued from six months to a year. If he wishes to have the wound closed, it can readily be done by cauterizing the mouth of the opening, a procedure which does not require an anæsthetic. As a rule, however, the patients do not seem at all anxious to have the opening closed, as it causes no inconvenience.

It is not advisable to use boracic lotion or other antiseptics for the purpose of irrigating the colon in cases of appendicostomy. Warm water or weak saline solution only should be used, unless there be some special reason for the use of antiseptics. The author has seen two cases of boracic acid poisoning through the use of boracic lotion in these cases.
(*See also* CONGENITAL DILATATION OF COLON.)
J. P. Lockhart-Mummery.

COLLAPSE.—This condition differs from SHOCK, SURGICAL (q.v.), in that the vaso-motor centres in the medulla are not exhausted as in shock, but are either temporarily paralyzed (as in the case of a blow in the abdomen), or are unable to maintain the blood-pressure on account of a sudden diminution in the quantity of circulating fluid in the blood-vessels (as in hæmorrhage). The best treatment in cases due to hæmorrhage is saline intravenous infusion, combined with the head-down position and bandaging the limbs. In sudden collapse, artificial respiration should be carried on until the patient has recovered.
J. P. Lockhart-Mummery.

COLON, CARCINOMA, CONGENITAL DILATATION, DIVERTICULITIS, OF.—(*See* CARCINOMA, CONGENITAL DILATATION, DIVERTICULITIS, OF COLON.)

COLOTOMY (Colostomy).—By this is meant the formation of an artificial anus in some portion of the colon. Lumbar colotomy is practically never performed now, and the only operation is that through the abdominal wall. The usual procedure is that generally known as inguinal colotomy, in which some portion of the sigmoid colon is used to form the artificial anus. The transverse colon or cæcum may be used in certain special cases, however, and the site of the opening will then vary accordingly.

Recently there has been a tendency for surgeons to perform transverse colotomy more often than formerly. The advantages claimed for transverse as opposed to sigmoid colotomy are that the apex of the transverse colon acts as a reservoir for the fæces and enables better control to be obtained; also, in cases of malignant diseases of the sigmoid, the opening is further away from the disease. In cases where a temporary colotomy is required the transverse colotomy is more easily closed. In the author's experience excellent results as regards control are often secured by transverse colotomy, but very occasionally a case is met with where the contents of the transverse colon are permanently liquid, with very tiresome results. Transverse colotomy can be performed through the same incision as the ordinary sigmoid colotomy; the portion of the transverse colon chosen should be well up towards the splenic flexure.

Colotomy is now performed in the following circumstances: (1) To relieve obstruction; (2) As a preliminary to excision of the rectum in some cases; (3) To deflect the fæcal current in cases of severe and intractable ulceration of the lower bowel; (4) To relieve pain and discomfort in cancer, more especially in epithelioma of the anus.

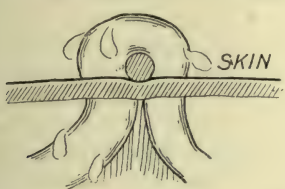


Fig. 12.—Diagram to show method of performing colotomy with a rod or clip.

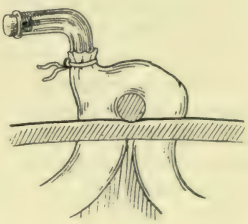


Fig. 13.—Diagram of colotomy, with a Paul's tube tied into the upper end of the bowel. Method used when bowel has to be opened at once.

THE OPERATION.—With the usual antiseptic precautions a vertical incision about three inches long is made over the left rectus abdominis muscle and with its upper end about one inch below the level of the umbilicus; the incision should be rather towards the outer side of the rectus. When this muscle is reached, its fibres are split and not divided. Contraction of the rectus muscle will subsequently give the patient a considerable amount of control over the opening. The muscles are split in the line of their fibres, and the peritoneum is opened. A loop of sigmoid flexure is then sought for and pulled out through the incision. If difficulty is experienced in finding the sigmoid flexure, the parietal peritoneum should be traced outwards with the fingers until the bowel is found. The sigmoid flexure must be pulled out until the highest portion which can be made to reach the incision is found, and this should be used to form the spur, the rest being returned. A piece of glass rod or a clip is then pushed through the mesentery just beneath the bowel (*Fig.* 12), so that the ends of the rod will rest upon the skin on each side of the incision, and support the loop or knuckle of bowel outside the abdomen. Each end of the incision should then be partly closed by a stitch, which should also take up one of the longitudinal muscle-bands on the bowel. The object of this stitch is to close in the triangular opening at each end of the wound, and at the same time, by anchoring the bowel, to prevent prolapse of more bowel through the opening. There is a distinct advantage in making the incision in the abdominal wall as high up as possible; the liability to prolapse through the opening is much reduced thereby.

The operation is now complete, and a small piece of sterilized protective or rubber sheeting should be placed over the projecting bowel, and the whole covered with the usual

dressings. If it is necessary to open the bowel at the time of the operation, a Paul's glass tube (*Fig.* 13) should be tied into the projecting loop of bowel.

After-treatment.—At the end of twenty-four to forty-eight hours after the operation a cut should be made transversely into the bowel with a pair of scissors. If there is any bleeding it should be stopped by pressure, or the vessels caught and tied off. No anæsthetic is necessary for this, as the bowel wall is not sensitive. At the end of eight to ten days one blade of a pair of scissors should be placed along the hole in which the glass rod is lying, and the bowel cut completely in half, so as to release the rod; any projecting bowel can also be trimmed off. In this also no anæsthetic is required.

Results of Colotomy.—In old days a colotomy opening was often a source of much distress and discomfort to the patient. Now, with a good colotomy opening, the patient has practically no inconvenience whatever, and can keep himself as clean as if the bowels acted in the ordinary way. One of the writer's patients played football all one winter without the colotomy opening causing him any trouble. *J. P. Lockhart-Mummery.*

COMA.—(*See* Acidosis, Apoplexy, Diabetes, Poisoning, etc.)

COMPRESSED-AIR ILLNESS.—(*See* Caisson Disease.)

CONGENITAL DILATATION AND HYPERTROPHY OF THE COLON.—This disease is also known as Hirschsprung's disease and idiopathic dilatation of the colon. The name here used is, however, that which best describes the condition. A good deal of uncertainty still exists as to the nature and causes of the disease, the chief symptoms of which are enormous distention of the abdomen due to dilatation of the colon, and severe and intractable constipation. The majority of cases occur among young children; but the disease is not confined to any age, and cases are met with at almost all ages. Part, or the whole, of the large intestine may be involved, and the affected bowel is found to be enormously dilated, and its wall much hypertrophied. The diagnosis may be established by examination with the sigmoidoscope and by *x*-ray examinations after bismuth enemata or a bismuth meal.

Non-operative treatment is confined to attempts to get the bowels to act with regularity, and is generally only effective for a short period. The only treatment which appears to have resulted in a cure has been an operative one, and the best results have followed complete resection of the entire portion of bowel involved. The operation is of a severe character, for not only does it necessitate the removal of a considerable length of the large bowel, but as this bowel is enormously dilated and its mesentery consequently shortened, the operation may be one of the greatest difficulty. The writer has had one very successful result from appendicostomy, which, by allowing the large sacculated colon to be regularly washed out, prevented accumulation in the distended sac. Colotomy is an operation which should never be performed in these cases. The mortality from it has been considerable, as the large dilated muscular bowel almost always tears away from the abdominal wall, and the patient dies from acute peritonitis.

For further particulars of this curious disease the reader is referred to the author's book, *Diseases of the Colon.* *J. P. Lockhart-Mummery.*

CONGENITAL DISLOCATION OF THE HIP.—The condition either arises in utero, or the child is born with a mal-developed acetabulum, with the result that, on commencing to stand and walk, the head of the femur is displaced above the level of the acetabulum. The latter is small, and the centre of ossification in the head of the femur is smaller, judging from *x* rays, than the centre in a normal hip; but they both, after successful reposition, will make up in time for the tardy development I have had only two cases diagnosed in the first few months; as a rule the condition is not suspected till the child stands and walks, when the very suggestive and painless waddle if bilateral, or limp if unilateral, leads to examination and diagnosis.

The limb can be adducted so that it crosses the middle or even the upper third of the opposite thigh. The head of the femur is not where it ought to be; it cannot be felt supporting the femoral vessels below the mid-point of Poupart's ligament; it can be felt on the dorsum ilii, especially if the limb be adducted and rotated internally. 'Telescopic

movement' is a good sign in children over the age of 3 years, and the test should be applied with the hip flexed to a right angle. The *x* ray shows the head of the femur above the shallow acetabulum. It may be noted that, in a new-born child, the *x*-ray pictures of a dislocated hip and of a separation of the cartilaginous upper end of the femur are identical. It is a great help to study stereoscopic radiographs of the case before commencing treatment, to obtain an idea of the amount of anteversion and the presence of coxa vara.

Treatment by manipulation in early life—e.g., under the age of 7 in unilateral, and under the age of 5 in bilateral cases—should give a perfect functional cure in 85 pre cent. The same treatment should be tried in unilateral cases till the age of 9 or 10, and in bilateral to the age of 7 or 8, but the prognosis must be more guarded. Above these ages it should be attempted only at the request of the parents after the risks and possibilities of failure have been explained.

1. **Treatment in Early Life.**—The first obstacle to reduction is the shortness of the muscles running from the pelvis, roughly parallel to the femur, to be inserted into the lower end of this bone or the upper end of the tibia. These muscles must be stretched in turn under an anæsthetic. (*a*) The adductors are stretched by abduction of the flexed thigh while the pelvis is fixed by an assistant. (*b*) The hamstrings are stretched by flexion of the hip with the knee extended, till the foot is by the side of the head ; in this manipulation the operator's hand must grasp the lower end of the femur and its epiphysis, as injury to the latter is possible. (*c*) The rectus muscle is stretched by hyperextension of the thigh with the knee flexed. This 'stretching' sounds more brutal than a clean division by an open operation, and the adductors especially, in older children, may require considerable kneading to make them yield. Nevertheless, in an average case, stretching is preferable, and after reduction of the dislocation the very tightness of the muscles becomes an asset, in that it presses the head of the femur harder into the acetabulum.

Following the stretching, the dislocation is reduced. Every surgeon has his own favourite method, but the ordinary flexion, adduction, and circumduction is very effective. The entry of the head into the acetabulum with a snap can be heard, or felt, or seen. The hollow of Scarpa's triangle is filled up, and the knee-joint cannot be now extended, as the hamstrings have become taut. On the whole, the more difficult the reduction, the less likelihood there is of redislocation.

After the reduction, the anterior part of the capsule is stretched thoroughly till the knee lies in a plane posterior to the trunk, and the position of the limb is as if the hip were first flexed to 90°, and there abducted through an angle of 95°. It is fixed in plaster-of-Paris in this position, and there is no advantage in fixation of the knee in the plaster.

Should the case be a bilateral dislocation, I usually do the left side first. Should the case be a unilateral dislocation, it is wiser to include the opposite hip-joint in the plaster unless the *x* ray shows this hip to be quite normally developed. The point is that otherwise the one hip will be fixed in full abduction, and the child will strongly adduct the good hip, and so place it in the most favourable position for the head to slip over an under-developed upper margin of the acetabulum.

The child will require a dose of chloral for one night after the operation, and younger children may suffer from incontinence of urine for a few days and require special protection for the plaster. The mother or nurse must be shown how to extend the knees passively so as to stretch further the hamstrings, and the child will get about in this extraordinary position. In an average case, this position is maintained for four to five months, when a plaster may be reapplied in a less abducted position, the whole duration being about seven months in plaster : it is impossible to fix an exact time, for each case must be treated on its merits.

After removal of the plaster, stereoscopic *x* rays may show the head of the femur in the acetabulum. The hip will be a bit stiff, but will rapidly loosen up to a full range of movement with the use of a skipping-rope and massage. The *x* rays may show the head of the femur too far forward. Should it be lying to the mesial side of the trochanter, the child will get a perfectly useful functional result, and the only additional treatment is to place a sand-bag or pillow under the knees at night to keep the hips slightly flexed.

Should the *x* rays show the head to be lateral to the trochanter, or the head to be posterior to the acetabulum, then a fresh attempt must be made to get the head into the acetabulum, for in neither of these positions can the child get a useful functional result. If the second attempt to manipulate the head into the acetabulum, and maintain it there, be a failure, an open operation is necessary.

2. **Treatment in Later Childhood.**—The age limits for this manipulative treatment were indicated above, and we now turn to the treatment of cases above these ages. In an untreated case the weight of the trunk is transmitted to the femur through the iliopsoas muscle ; this muscle, passing over the brim of the pelvis and back to the lesser trochanter, supports the pelvis as in a sling. Hence, the better this muscle is developed, the less tendency there is to upward and downward movement of the head of the femur. The unsightly gait of the patient is largely due to the loss of function in the muscles running from the pelvis to the great trochanter. In a normal hip, when the patient stands on one leg, the pelvis is tilted up on the opposite side. In a patient with congenital hip, the pelvis remains horizontal or is even depressed on the opposite side, owing to the weakness of these pelvi-trochanteric muscles. Therefore an untreated case of congenital hip should be encouraged to develop the psoas and the abductors of the hip by all forms of gymnastic exercises, though as a preliminary it may be necessary to divide the adductor longus and other adductors to allow the abductors free play.

In unilateral cases the question of a high boot must be considered. If the shortening of the limb be compensated fully, the result is a tendency to adduction, and the head of the femur is applied more obliquely than ever to the dorsum ilii. As the adduction increases, the real shortening is increased by some additional apparent shortening, and a boot higher still is required. Therefore the shortening should not be fully compensated by a high boot.

3. **Treatment in Adults.**—In adults the symptoms are probably those of arthritis deformans in the dislocated joints, or are due to scoliosis, or in bilateral cases to the lordosis. In the hips relief can usually be obtained by iodides internally, and counter-irritants—e.g., iodine, liniments, hot-air baths—externally. In unilateral cases, at any rate, the weight of the body can be transmitted from the tuber ischii to the ground by a Thomas's caliper splint, and so the joint be eased. The symptoms of scoliosis or lordosis can be relieved by some form of support. *Robert Milne.*

CONGENITAL PYLORIC HYPERTROPHY.—In considering whether a case of congenital pyloric hypertrophy is to be treated by medical or surgical measures, it is well to realize, to begin with, that the disease is in a sense self-limited—that is to say, that the narrowed pylorus has a tendency to open spontaneously after a time, and that the child will recover in this way, provided his strength can be maintained until this process has had time to take place. In an ordinary well-marked case, there is at first a period of some weeks during which the food passes from the stomach into the bowel easily and in sufficient amount to allow a normal gain in weight and vigour. Then, as the lumen becomes increasingly obstructed by the growing hypertrophy of the muscle, severe vomiting sets in, and the weight falls rapidly in spite of all treatment. In severe cases, no medical treatment is capable, at first, of stopping this loss of weight ; but with careful feeding and stomach-washing it is very often possible to diminish or arrest it after some weeks ; and, at the end of a month or two, during which the weight has remained stationary, the natural process of recovery sets in. The improvement which now begins is probably due to three things—to the abnormal contractions of the muscle lessening, to the muscular hypertrophy slowly subsiding, and to the relatively rigid peritoneal tube gradually enlarging. When once the gain in weight has begun, it is usually rapid and continuous, and the child is soon practically well.

What the physician expects to do, therefore, in treating an early case, is not to make the child gain weight quickly, for no medical treatment is known which will do that at this stage, except in a few very mild cases, but to induce the narrowed and irritable pylorus to let through enough nourishment to keep the child alive until nature's slow process of cure has had time to develop. Skilful nursing is essential, and it is especially important to avoid any chance of infectious diarrhœa occurring, as this is almost always fatal in these cases.

Medical Treatment.—Most cases of congenital pyloric hypertrophy can be successfully treated by medical measures alone, provided the symptoms are not very acute in their onset, and the children are under proper care from the beginning until the natural process of recovery has fairly begun. In the very acute cases, however, the loss in weight and strength is so rapid that the risk of an operation is certainly less than that of prolonged medical treatment. The same is true in the case of moderately severe stenosis when close attention and very careful nursing cannot be supplied. If an operation is performed, and is successful in causing the free passage of food into the bowel, the weight begins to increase rapidly almost at once. Should this end not be attained, however, the weight remains stationary for many weeks, as in the medically treated cases.

The choice of treatment then, depends largely on the degree of severity of the stenosis. In early cases this can be found out partly from a consideration of the symptoms and the present state of the child, but chiefly from observing the result of a short preliminary course of treatment by restricted diet and lavage. I usually begin by giving one-and-a-half or two ounces of dilute peptonized milk every two or three hours, and gradually increasing the amount ; the stomach should also be washed out once or twice daily with plain warm water. In very mild cases this treatment has an immediate effect in stopping the vomiting and initiating a gradual gain in weight ; and its continuance is all that is necessary. In ordinarily severe cases the vomiting is almost always stopped or much diminished by it at first ; but it is apt to recur badly whenever an attempt is made to increase the food to a normal amount. In the most severe and acute cases the vomiting and loss of weight are not influenced at all by these medical measures.

Many of the children treated in hospital, and some of those in private practice, are only brought to us after a long course of injudicious feeding. By the time we see them they are in a state of collapse and toxæmia, with gastric catarrh and dilatation ; and, owing to the constant vomiting, they are suffering acutely from thirst and drying-up of the tissues. In this condition the first indications are to wash out the stomach at once, to stop all food and fluids by the mouth for twenty-four hours at least, and to give subcutaneous infusions of normal saline solution (3 to 6 oz. into the back or flanks every four to six hours). The giving of the infusions does not usually put the child much about, and the effect on his strength and comfort is very striking. In a few cases, however, the subcutaneous tissues are very sensitive, and the infusions cause so much pain that they cannot be long continued. Nutritive enemata are of little or no use, but it is always well to give rectal injections of an ounce or two of saline solution every four to six hours, if the child can retain them. For these injections a small catheter should be used, and they must be given very slowly and carefully, as they are apt to be returned. Many of the children are able, for several days, to retain all the fluid given, but some resent the injections even more than the saline infusions.

The result of the treatment of cases of pyloric hypertrophy by medical measures alone varies greatly according to the amount of skilled nursing and attention which can be obtained. Consequently, in my experience, the mortality has been small in private practice (21·7 per cent) ; while among hospital patients it has been comparatively very large (74·2).

If, after two or three weeks in an ordinary case, the child is failing to respond to medical treatment and is losing ground—and sooner in severe cases—a surgical operation should be advised without further delay.

The application of a series of hot fomentations to the abdomen, and the administration of sedatives such as atropine and opium, have been recommended as useful auxiliary measures, but I have never found any decided advantage from their use.

Surgical Treatment.—The chief operations which have hitherto proved successful are four in number : (1) Gastro-enterostomy, first performed with success by Löbker (1898), and Kehr (1899) ; (2) Forcible stretching of the pylorus (Loreta's operation), introduced by J. H. Nicoll, of Glasgow, in 1900 ; (3) Pyloroplasty, advocated by Cautley and Dent (1902) ; and (4) Simple division of the circular muscular layer of the pylorus by a linear incision through the peritoneal coat without opening the stomach and without stitching—this was recommended by Rammstedt, of Münster, in 1913.

From a comparison of the published results of 135 operations, Dufour and Fredet give the mortality of the older operations as follows : gastro-enterostomy, 57 per cent ;

Loreta's operation, 42 per cent; pyloroplasty, 41 per cent; and various combinations of these, 52 per cent. In considering such statistics, we must remember that many of the unsuccessful cases have probably not been recorded. In a recent paper Holt mentions that in 41 cases of gastro-enterostomy in his practice the mortality was 51 per cent; while, in 67 in which Rammstedt's operation was performed, it was only 24 per cent. Out of 100 consecutive cases of congenital pyloric stenosis under my care during the last twenty-five years, there were 14 cases of gastro-enterostomy, with a mortality of 64 per cent, and 18 of Loreta's operation, with 61 per cent of deaths; in 5 in which Rammstedt's operation was done, the mortality was 20 per cent. The general experience has been that Rammstedt's operation is far superior in its results to any of the others, and should always be preferred to them. As might be expected, the rate of mortality of all the operations differs according to the period at which they were done. It has been lower in recent years, as the cases are now brought much earlier to the surgeon.

The rate of mortality in all the different operations, as in the medical treatment, differs also very much according to the degree of care and skill in the after-treatment, and especially in the nursing. Consequently, in private practice, where the baby is the sole charge of skilled nurses, both night and day, and is in no danger of acquiring infectious diarrhœa, it has, in the writer's experience, been very much smaller (18·2 per cent) than that of the hospital cases, in which it has been very large (78 per cent).

Except in the most severe and acute type of case, it is always desirable that the patient should be carefully treated by medical measures for several days before an operation is performed; for it is seldom that they cannot be so much improved by such treatment as to be better able to stand the operation.

If the child survives the operation, and it is successful in securing a free opening between the stomach and bowel, all the symptoms cease in a week or two, and the patient makes a rapid recovery. In many instances, the opening made by the older operations was not sufficient; immediate relief did not therefore occur, and the symptoms persisted for weeks before recovery set in. Such delayed recovery, however, will probably be found to occur rarely after Rammstedt's operation; but fatal hæmorrhage occasionally takes place.

In all cases, continued medical as well as surgical care is most important, and the diet must be carefully regulated, because the bowel is apt to resent the sudden increase of its contents, and there is a risk of troublesome diarrhœa setting in.

Prognosis as to Health in Later Life.— The condition in after-life of the patients who recover after either medical or surgical treatment is nearly always very good. Of the writer's first 100 cases, 42 recovered—14 after a single operation, 2 after two (Loreta's, followed by gastro-enterostomy), and 26 after medical treatment only. Five of the children have since died from various causes not connected with the stomach, and four who were doing well, at various ages, when last seen, have been lost sight of. The remaining 33, whose present ages vary from one to seventeen years, are all in very good health. A few of them suffered, for two or three years at first, from recurrent vomiting attacks; but now they are all free from gastric symptoms. Dr. Nicoll's first patient, who was the first case in Great Britain to recover from an operation for this disease, was examined in 1918 for the Army, and passed as A1.

It seems certain, therefore, that the danger of the disease to life, and even to health, is merely temporary, and that the patients who have suffered from it in infancy are in no way handicapped in later life. So far, those children who were operated on seem to have thriven just as well as those who were medically treated. *John Thomson.*

Surgical Treatment.—If in spite of medical treatment weight is steadily lost and the quantity of curd returned shows no diminution, operation should be undertaken. Rammstedt's operation, in which the circular muscle-fibres in the pyloric region are divided longitudinally down to the mucous membrane, is the procedure with the lowest death-rate; it has almost completely supplanted gastro- jejunostomy.

Care in post-operative treatment is essential. The child should be kept warm, and if rectal salines have been given, or are considered necessary, they should be resumed until sufficient fluid is being taken by the mouth. The pre-operative feed of peptonized milk should be continued for at least ten days, and then the feeding gradually brought to that of a normal child. *James Sherren.*

CONGENITAL TORTICOLLIS.—(*See* TORTICOLLIS, CONGENITAL.)

CONGESTION, PULMONARY, and ŒDEMA.—Passive congestion and œdema of the lungs are associated especially with the cardiac failure of chronic bronchitis and emphysema, chronic heart disease or renal disease, etc., and are usually accompanied by the general signs of cardiac failure, e.g., cyanosis, dyspnœa, scanty urine, œdema of the legs, body, etc. Often it appears to be the beginning of the actual process of death.

The treatment is largely dependent upon the condition with which it is associated. In most cases there is urgent need for active intervention in order to relieve the overworked heart; sometimes, however, the œdema develops in association with profound anæmia or cachexia, parenchymatous nephritis, cerebral disease, toxæmias, etc., and there is no evidence that it is caused or even aggravated by mechanical difficulties. In this second group the œdema is almost always a sign of impending dissolution, and treatment is seldom of avail.

The indications for treatment will depend almost entirely on the causative condition. In the first group, if the mechanical difficulties can be diminished and the heart stimulated, treatment may often have a very satisfactory result.

In the most serious cases, with cyanosis and engorgement of the veins and right side of the heart, venesection often gives prompt relief; 15 to 20 oz. of blood should be withdrawn from the median basilic vein. Unfortunately, there is a prejudice on the part of the general public against the treatment, and if it is not successful the practitioner may incur undeserved blame. It can, however, be confidently asserted that in many cases no other form of treatment is so likely to meet with success. In less serious cases blood may be abstracted by leeches, and bleeding from the leech-bites may be encouraged by the subsequent application of fomentations. Dry cupping is sometimes employed, but compared with bleeding or leeching is a very inefficient method for securing venous depletion.

The posture of the patient should receive careful consideration; a comfortable easy chair with a support in front on which the patient may lean is often preferable to a bed. When sitting, the patient can breathe more easily, and the support to the arms permits the action of the accessory muscles of respiration. Moreover, gravity allows the blood to accumulate in the portal area, so that the distention of the right side of the heart is relieved and the œdematous fluid collects in the legs, where it causes less mechanical trouble. A patient with passively congested lungs may often be coaxed to sleep in a chair, though insomnia troubles him while he remains in bed. Œdema of the lungs is often associated with effusions into the pleura or peritoneum, and with œdema of the dependent parts; collections of fluid in the pleura or peritoneum should be removed slowly by paracentesis.

If there is great œdema of the legs without renal disease, it is often advisable to allow the fluid to escape either by multiple small punctures through the skin or by the insertion of Southey's tubes, the strictest aseptic precautions being observed. When there is renal disease, the risk of sepsis following puncture is so great that the operation is seldom advisable.

In some cases of pulmonary œdema with cyanosis the inhalation of oxygen is of value; the gas delivered direct from the cylinder is very cold owing to the sudden expansion; it is also very dry; to mitigate these disadvantages, it is wise either to fill a bag with the gas and allow it to remain in the room for some time before administration, or to pass the gas through a tube coiled in a can of hot water, or to allow it to bubble through hot water in a bottle arranged for the purpose with two tubes through the cork, the supply tube passing well below the surface of the water. The effect of the administration of oxygen should be carefully watched, and continued only if relief is obvious. It is best to keep the cylinder and any cumbrous apparatus out of the patient's sight.

The use of drugs in the treatment of pulmonary congestion and œdema depends almost entirely on the etiology of the condition. Roughly they may be grouped into those which are used as whips to thrash the tired heart into increased effort, those which are true cardiac tonics augmenting the muscular tone, and those which aid the heart's action by diminishing the resistance which it has to overcome. Many drugs, however, may be included in more than one of the above groups.

Of the cardiac whips, ammonia, ether, strychnine, and caffeine are the most commonly employed :—

℞ Spiritus Ammoniæ Aromatici | Aquæ Camphoræ q.s. ad ℥j
Spiritus Ætheris āā ♏xxx |

Occasionally.

Or

℞ Injectionis Hypodermicæ Strychninæ Hydrochloridi 1% ♏ij–iv (i.e., gr. $\frac{1}{60}$–$\frac{1}{30}$)

Every four hours if necessary.

Or,

℞ Caffeinæ Sodio-Salicylatis gr. ij–v

To be given as an intramuscular injection occasionally, or if necessary every four hours.

Or,

℞ Camphoræ gr. ii | Olei Olivæ ♏ x
Ætheris ♏ iij

For hypodermic injection.

Of the cardiac tonics, digitalis and strophanthus are the most frequently employed. The effect as a rule is not noticeable until thirty-six to forty-eight hours after the commencement of administration.

℞ Tincturæ Digitalis ♏xv | Potassii Acetatis gr. x
Infusi Digitalis ℥ij | Aquæ Chloroformi q.s. ad ℥j

Every three or four hours.

Or Nativelle's granules of digitalin (containing $\frac{1}{4}$ mgrm. of digitoxin) may be given thrice daily for not more than a week at a time.

In prescribing digitalis, it must be remembered that it is cumulative in action, that it constricts the peripheral arterioles, and often acts as a gastric irritant, causing vomiting. Strophanthus to a large extent is free from these defects ; it should be tried if digitalis cause vomiting, if the vessels be degenerate, or the aortic valves incompetent.

℞ Tincturæ Strophanthi ♏iij | Syrupi Aurantii ℥ss
Tincturæ Cardamomi Co. ℥ss | Aquæ q.s. ad ℥j

Every four hours.

The third group consists of drugs which reduce the work of the heart in various ways ; some act as vasodilators, e.g., amyl nitrite, liquor trinitrini, sodium nitrite, erythroltetranitrate, etc. ; others, like mercury or aperients, by withdrawing fluid from the blood ; yet again others in a manner as yet undecided, e.g., the iodides, alcohol, etc. These drugs are seldom prescribed alone ; in fact, drugs from all three groups are frequently combined with advantage :—

℞ Tincturæ Digitalis ♏x | Spiritus Ammoniæ Aromatici ℥ss
Infusi Digitalis ℥j | Aquæ Camphoræ ad ℥j
Potassii Iodidi gr. iv

Every four hours, the effect on the pulse being carefully watched.

Or,

℞ Pulveris Digitalis Foliorum | Pilulæ Hydrargyri āā gr. j
Pulveris Scillæ

Ft. pil. Twice daily.

Saline aperients and mercurial purges are often of great value, and are best given separately, e.g., a grain of calomel may be given at night, to be followed in the morning by a dose of magnesium or sodium sulphate, Carlsbad salts, Hunyadi, Friedrichshall, Apenta, or the like.

The value of alcohol in pulmonary œdema is generally doubtful ; it seems to act best when there is pyrexia. A good rule is to try a small dose of good old brandy or malt whisky containing plenty of ethers, and be guided by the result ; if the benefit be not soon obvious, it is useless, and possibly harmful, to repeat the dose.

Diaphoretics are occasionally recommended in the treatment of pulmonary œdema : it is best to avoid their use. Occasionally they may be actually dangerous ; for instance, pilocarpine may lead to a great increase of the bronchial secretion, and hot-air baths usually prove very exhausting to the patient.

Sleep is of supreme importance ; the measures that may be adopted in the attempt to secure it are those which have been discussed in connection with Bronchitis, Chronic.

Cecil Wall.

CONJUNCTIVA, DISEASES OF.

CONJUNCTIVITIS.

The essentials in the treatment of all conjunctivitis consist in (1) Ridding the conjunctiva of any specific germ, if present; (2) Washing away the discharge and preventing its collection behind the closed lids; (3) Keeping a careful watch on the cornea; (4) Maintaining the health of the patient.

The chief danger in conjunctivitis is the implication in one way or another of the cornea—either by ulceration, which may go on to perforation and loss of the eye, or by cutting off the blood-supply by intense swelling of ocular conjunctiva and episcleral tissue, supplemented by pressure of the swollen lids, which may lead to degeneration and even sloughing of the whole cornea.

Hence, in every case of conjunctivitis, the cornea must be thoroughly examined at the first visit, and a careful watch kept that the earliest sign of impairment be detected, from the point of view both of treatment and prognosis. In any case of doubtful nature, smear-preparations of the discharge should be taken for microscopic examination, or a swab sent for laboratory investigation.

In examining the cornea, great care must be taken not to press on the lid, lest the surgeon himself cause the perforation of an ulcer which has already nearly penetrated. The skin of the lid should be dried and the lid lifted with the thumb placed lightly close to the ciliary margin. If this is impracticable from the amount of swelling, a lid retractor may be used; or if the patient is refractory and there is much blepharospasm, an anæsthetic must be given. (In using the retractor care should be taken not to touch the cornea with the instrument, lest an abrasion be caused, which may be the starting-point of an ulcer. If a retractor is not at hand, the loop end of a sterilized hairpin bent round makes a handy and useful instrument.)

Applications are made to the conjunctiva of varying strengths, suitable to the nature of the inflammation, combined with frequent irrigations with some bland solution, to wash away the discharge. The lid margins are moistened with ointment to prevent their sticking together, and to allow the discharge to escape. *No bandage should be used,* but the eyes are protected by a shade,* or dark glasses. If the discharge is profuse, and the lids are so swollen that they cannot be everted, the external canthus must be divided to allow applications being made right up to the fornix. This is easily done with one snip of a strong pair of sharp scissors, of which one blade is passed into the conjunctival sac, the other being outside. The cut is made straight through, from skin to conjunctiva, in the line of the external palpebral ligament. The resulting scar soon becomes quite invisible.

If corneal ulceration occurs, atropine is given, and our treatment of the conjunctiva must be still more assiduous. If necrosis of the cornea sets in, eserine, 2 gr. to the ounce, may be used as a corneal stimulant, and if there is much chemosis, and the swollen lids are pressing unduly and impeding the circulation, division of the external canthus is also called for.

Tonics are ordered if necessary, and plenty of fresh air is ensured. Even in the milder cases, close work of all kinds is prohibited, and the patient is told to avoid all dust and smoke.

To prevent the spread of the infectious forms of conjunctivitis strict injunctions must be given that no one but the patient use his towel, sponge, etc., and that such articles, and handkerchiefs, be carefully disinfected.

In the severe forms of infective conjunctivitis, where one eye alone is attacked, the other must be protected at once by a glass shield (Buller's shield).

Nitrate of Silver.—Of the various silver salts used for painting the lids, silver nitrate is the most efficacious in cases of severe conjunctivitis associated with purulent discharge. Protargol and argyrol cause less pain, but their curative effects are not so thorough.

A few hints as to the method of applying silver nitrate may be of value :—

---

* A shade made of brown paper with a tape run through near the upper border is useful, and can be changed at once on getting soiled.

1. A stronger solution than 2 per cent should not be used. One light application of this strength is generally sufficient, but if a greater effect is desirable, any degree of cauterization can be obtained by mopping the conjunctiva after the first application and painting again, and so on, till the required effect is produced. With the stronger solutions, too great an effect may be obtained at the first application. After using the 2 per cent solution, it is not essential to neutralize with salt solution. The excess should be mopped up, keeping it as much as possible from the cornea, and the eyes should then be bathed with boracic lotion. A few drops of 15 per cent solution of glycerin allays the pain.

2. The stick of pure nitrate of silver should *never* be used in conjunctivitis.

3. When the discharge is profuse, the eyes should be painted once a day; in very exceptional cases twice a day, but never more frequently. *A second application should never be made till the slough produced by the preceding painting has come away.*

4. Silver nitrate should never be used (*a*) in membranous conjunctivitis, when the membrane is adherent and cannot easily be wiped off; (*b*) When there is brawny infiltration of the lid, lest the caustic produce a deep necrosis of the tissues of the lid.

5. As the discharge diminishes, the applications must be correspondingly less frequent, and when it has ceased, painting must not be made more than once or twice a week, the conjunctiva being brought back to its normal condition with zinc chloride (1 gr. to the ounce), zinc sulphate (2 gr. to the ounce), or copper sulphate (1 or 2 gr. to the ounce).

6. The best way of applying the solution is with a cotton-wool mop, made by twisting a little wool round the drawn-out end of a small glass rod. Be sure that the end of the rod is quite smooth and rounded. The projecting portion of wool makes a soft brush, which can easily be removed and renewed. A fresh one is used for each eye. (A camel's-hair brush is not so aseptic, and the quill is apt to scratch the cornea when painting out the fornix, so important in gonorrhœal conjunctivitis.)

The effects of too frequent or too strong applications of silver are sloughing of the lids, and a grey-white opacity or even destruction of the cornea. Too prolonged use of silver causes permanent greyish or brown staining of the conjunctiva.

Gonorrhœal Conjunctivitis and Ophthalmia Neonatorum.—Though many cases of ophthalmia neonatorum are not due to gonococcal infection, the treatment is identical in the two cases.

Every man or woman with gonorrhœa should be warned of the risk of acquiring conjunctivitis, and in order to avoid this, be instructed how to maintain the necessary cleanliness (e.g., by not washing the face in the bath, using a special face towel, care with regard to the sponge, etc.), since this disease in adults often runs a very serious course, and may lead to the loss of one or both eyes, even in spite of treatment. Also those attending to these cases must realize the importance of absolute cleanliness, and of disinfecting or destroying everything that has come in contact with the discharge.

In ophthalmia neonatorum, prevention is better than cure. (1) The baby's face and lids should be carefully wiped directly the head is on the perineum; (2) After the child is born the eyes should be well washed with a sublimate solution, 1–4000; (3) If there is any suspicion that the case is not a clean one, a drop of a 2 per cent solution of silver nitrate should be dropped into each eye in addition to the above treatment; (4) At the baby's first bath, the face and hands should not be washed in the same water that has washed its body; (5) As soon as there is any sign of inflammation, treatment should be begun forthwith.

Constitutional Treatment.—This is very important, and in the case of adults the general health must be maintained with generous diet, tonics, and stimulants if necessary, and the depressing influence of the disease as far as possible alleviated.

A baby should sleep in a cot, and not with its mother. In a severe case which needs admitting to hospital, the mother should, whenever possible, be also admitted, that the child may have the advantage of being breast-fed.

Local Treatment.—If one eye only is affected, the other should at once be protected with a Buller's shield, great care being taken in adjusting it, so that the plaster be made to adhere very firmly down the nose. The chief danger of the complaint being ulceration and perforation of the cornea, a thorough examination must be made at the first visit (*see above*), and also later from time to time. Great care must be used to prevent abrasion of the cornea with a finger-nail or the retractor.

In the first stage (infiltration), when there is brawny infiltration of the lids, or membrane adherent to the conjunctiva, *silver nitrate must not be used*, but instead rounds of lint soaked in a cold boric solution placed over the eyes and frequently changed, combined with frequent irrigation* with mild antiseptics, such as boric lotion, or sublimate solution 1–10,000. In adults, leeches may be applied to the temples if there is much pain.

As soon as the second stage is reached, the discharge thoroughly established, and the brawny condition of the lids has subsided, painting with 2 per cent solution of nitrate of silver must be begun, combined with very frequent irrigation. The painting should be done once a day, or, where the discharge is very profuse, twice a day. A second application must not be made until the slough produced by the preceding painting has come away. The wool swab should be introduced right up to the fornix, great care being taken not to injure the cornea either with swab or finger-nail. If there is so much swelling of the lid that painting cannot be carried out, and the discharge cannot get away, the external canthus should be divided (see above). The irrigation with sublimate solution, 1–10,000, should be carried out every hour during the day, and every two hours during the night, with swabs of wool soaked in the lotion, or with the 'undine'. All discharge is scrupulously washed away, and the lid margins are moistened with ointment to prevent sticking.

As soon as the discharge has ceased, painting must be stopped and replaced by astringent drops (e.g., zinc chloride, 1 gr. to the ounce), or the application of the copper sulphate stick.

Complications.—1. Corneal ulceration. Silver is not contra-indicated, but neither zinc sulphate or chloride, nor copper sulphate should be used. Atropine ointment, 4 gr. to the ounce, should be inserted between the lids twice a day, and still greater care must be used in manipulation, to prevent perforation. While there is purulent discharge, even if there is infiltration of the ulcer, perforation, or prolapse of the iris, nothing in the way of operation can be done until the conjunctival sac is clean. (For later treatment *see* CORNEA, DISEASES OF.)

2. If there is intense swelling of the lids and conjunctiva, and the cornea becomes grey and hazy from the cutting off of its blood-supply, the external canthus should be divided to relieve pressure, and eserine drops, 2 gr. to the ounce, instilled twice a day to try to improve the nourishment of the cornea. (*See also* GONORRHŒA.)

Acute Catarrhal Conjunctivitis. — The most severe cases of acute catarrhal conjunctivitis should be treated in the same way as gonorrhœal cases (q.v.). In the milder forms, it is not necessary to keep patients in bed ; they are better for being up and getting all possible fresh air, the eyes being protected with dark glasses and a shade. The conjunctiva should be painted once a day with 2 per cent silver nitrate or 30 per cent protargol so long as the discharge is profuse, and the conjunctival sac be washed out four times a day (more often if the discharge is very profuse) with boric acid lotion or a sublimate solution 1–10,000, boracic ointment being smeared along the edges of the lids, especially at bed-time.

When the discharge has ceased, chloride of zinc drops, 1 gr. to the ounce, should be used three times a day, and the silver discontinued.

If ulceration of the cornea occur in the acute stage, atropine ointment, 4 gr. to the ounce, should be inserted between the lids, in sufficient quantity to keep the pupil well dilated. Ulceration is no indication to stop the use of silver, but the ulcer itself should be painted only if it is infiltrated, and then very lightly. The cornea should be carefully protected from the silver if necrosis is threatening.† While there is discharge a bandage must not be used even if ulceration be present. Cauterization with actual cautery or pure carbolic is of no use in the presence of septic discharge, but if the ulcer remain infiltrated after the discharge has ceased, cauterization may be of great service. (*See* CORNEA, DISEASES OF.)

---

* A useful plan, if complete nursing is not available, is for the patient to have a bowl of cold lotion with rounds of lint soaking in it placed on the right side of the bed, and an empty bowl on the left side. A cool round is taken from the right bowl, applied to the eye and, as soon as it is warm, placed in the left bowl and replaced by a fresh one.

† Necrosis is recognized by a diffuse greyish-yellow infiltration of the whole cornea.

Chronic Catarrhal Conjunctivitis.—In all forms of chronic inflammation of the conjunctiva the refraction should be tested as a routine measure, and the correcting glass worn constantly. It is striking how even cases due to trachoma improve if the refractive error be corrected. The general health of the patient should be attended to, and avoidance of dust and smoke enjoined.

Locally, if there be discharge, lightly painting with 1 per cent silver nitrate solution, or 30 per cent solution of protargol, is useful. If small yellowish-white concretions are seen in the conjunctiva, these should be picked out with a needle, after anæsthetizing with cocaine and instilling a drop of adrenalin. Astringent lotions, such as zinc sulphate (1 or 2 gr. to the ounce), zinc chloride (1 gr. to the ounce), weak alum, or tannin solution also are of service ; these should be used three times a day, but not the last thing at night. Before going to bed a mild ointment of boracic acid, or yellow oxide of mercury, ½ per cent, may be smeared along the edges of the closed lids to prevent their sticking.

In *angular conjunctivitis*, zinc sulphate, 2 gr. to the ounce, is generally the most useful lotion, but this often acts better when combined with occasional painting with protargol or nitrate of silver.

Follicular Conjunctivitis.—The recognition that the conjunctival condition is only a local manifestation of a general tendency to lymphatic overgrowth, shown elsewhere by adenoids, large tonsils, etc., is of the first importance in successful treatment. Fresh air, good simple food, and tonics, especially iron and cod-liver oil, are indicated. The refraction should be carefully tested, and the correcting glasses worn regu'arly (especially in cases of hypermetropia and astigmatism). Locally, zinc chloride, 1 gr. to the ounce, is found most useful in the chronic condition, while if there is discharge, painting with protargol twice a week is advisable till this ceases. If the granulations are very large, expression is often most useful. (*See* 'Trachoma.')

Follicular enlargement is often found associated with the more acute inflammations of the conjunctiva, especially acute catarrhal conjunctivitis ; it is also seen associated with atropine irritation. The combination of these two conditions at times may closely simulate trachoma. The importance of making a correct diagnosis cannot be over-estimated.

Phlyctenular Conjunctivitis.—(*See* CORNEA, DISEASES OF.)

Membranous and Diphtheritic Conjunctivitis.—Membranes on the lids are met with fairly commonly in severe conjunctivitis, apart from diphtheria, and cases can be divided conveniently into two groups :—

1. *Those in which the Membranes can easily be wiped off without leaving a Bleeding Surface.*—These should be treated as cases of acute catarrhal conjunctivitis (q.v.), but till the membrane disappears, solutions of nitrate of silver must be used sparingly, and if fresh membranes form which remain adherent, it must be altogether withheld.

2. *Those in which a tough Membrane is adherent, and if pulled off leaves a Bleeding Surface.*—These should be treated as diphtheritic till *the result of bacteriological examination is known*—a procedure of the utmost importance, both in making a correct diagnosis and in the after-treatment.

The patient must be isolated, and precautions against the spread of infection taken. As in other forms of diphtheria, antitoxin is our first line of defence ; and since the disease is usually very severe, the cornea becoming rapidly and irredeemably affected, when diphtheria is suspected antitoxin should be injected without delay.

General Treatment is the same as in diphtheria elsewhere. The patient's health must be kept up with plenty of food, stimulants being given if necessary. Rest in bed is essential. The heart must be regularly examined, and great care taken to avoid cardiac failure.

Locally, the chief danger being ulceration or necrosis of both cornea and lids, we have to maintain as far as possible the circulation in the conjunctiva, episcleral tissue, and lids, and our manipulations must be as gentle as possible. If only one eye is affected, the sound one must be protected by a Buller's shield.

In the first stage, when the lids are brawny and tense, several layers of hot boracic lint are laid over the eyes and frequently changed : these are kept in position if necessary by means of a bandage round the forehead, but not over the eyes. The discharge is washed away by frequent irrigation of the conjunctival sac with some bland fluid, such as boracic

lotion, by means of an 'undine' or swabs of wool. No silver nitrate or any caustic must ever be used in this stage. If the lids cannot be easily everted they should not be forced open beyond the degree necessary to make a diagnosis and allow the discharge to come away freely. When the second stage has been reached, and the lids have become soft, the membrane has come away, and the discharge is free, a 2 per cent solution of silver nitrate may be used once a day for painting the lids so long as the discharge lasts (*see* pp. 177–8).

When antitoxin cannot be secured, quinine lotion (sulphate of quinine, 4 gr. to the ounce, dissolved with the smallest possible quantity of dilute sulphuric acid) should be used to irrigate the conjunctival sac, four times a day.

Even when the cornea is affected, little more can be done. In the case of ulceration, we must be still more gentle in our manipulations, and atropine ointment should be inserted between the lids twice a day. Where the cornea becomes grey without ulceration, and necrosis is threatening, some prefer eserine ointment, 2 gr. to the ounce.

If in the treatment of severe cases the lids tend to become adherent to the ocular conjunctiva (symblepharon), the two must be kept apart during the healing process by daily passing a glass rod round as far as the fornix, and oily applications should be used, such as atropine ointment.

Trachoma.—The contagious nature of this serious disease is not, as a rule, sufficiently realized either by the patient or his friends. Warning on this point, therefore, should be impressive, considering the pain and discomfort the disease causes, its long duration, and its menace to sight. Towels, handkerchiefs, sponges, and flannels should be rigidly kept for the patient alone. Few cases, if treated regularly, get well in less than six months : many, owing to neglect, last a lifetime ; hence perseverance on the part of both doctor and patients is an all-important factor in successful treatment.

The chief dangers of the disease are :—

1. Pannus and ulceration of the cornea, leading to opacities and consequent impairment of sight.

2. Scarring of the lids, leading to entropion and trichiasis (which latter again leads to more ulceration and opacity of the cornea).

3. Shrinking and xerosis of the conjunctiva.

These are late signs, and occur when the disease has lasted many months : our object must, therefore, be to get the disease under control before they have occurred. The treatment of these conditions will be mentioned later.

The health of the patient should be well maintained. The eyes should be protected from glare, dust, and wind with large tinted glasses, and as in all cases of chronic inflammation of eyes and lids, the refraction should be tested when possible, and if there is any error, the correcting lenses in neutral tint should be worn.

Acute Cases.—Occasionally in the early stages there is a considerable amount of swelling of conjunctiva and lids ; sedative treatment should then be adopted, e.g., hot boracic bathing four or five times a day, and mild applications of silver nitrate solution, 5 gr. to the ounce, once a day. But when the acute symptoms have subsided, the conjunctiva must be vigorously treated with astringents.

Chronic Cases.—1. Where florid granulations exist, these should be expressed with either Grady's or Knapp's forceps. This is a very valuable but painful procedure, and should be carried out either after thoroughly cocainizing the conjunctiva with powdered cocaine, or under a general anæsthetic, preferably the latter. After everting the lids, all the granulations are thoroughly broken down and removed by squeezing between the forceps. (The eyes of both surgeon and assistants should be protected by glasses during expression, to prevent contagion.) After expression, soothing applications may be made for a day or two, followed by energetic astringent treatment.

2. When the conjunctiva is velvety, and there are no granulations (or any existing granulations have been expressed), regular painting must be carried out three times a week, or in severe cases every day, either with a 2 per cent solution of nitrate of silver, the copper stick, or a 2 per cent solution of perchloride of mercury in glycerin—the latter is painful but is often very efficacious. A few drops of 15 per cent solution of glycerin instilled after the application of silver or copper allays the pain. In addition the patient has his conjunctival sac well washed out with boric lotion, or sublimate solution 1–8000,

four times a day, and the edges of the lids smeared with boracic ointment, 1 drachm to the ounce, at night, to prevent the lids sticking together. At this stage the application of carbon dioxide snow is efficacious, but painful.

3. When scarring has begun, daily application of the copper stick is by far the best remedy, and this should be continued till all traces of hypertrophy of the conjunctiva have disappeared. Where such frequent applications of copper either cannot be made or are unnecessary, the patient may use copper sulphate drops, 2 gr. to the ounce, twice a day, in addition to the sublimate lotion.

Pannus usually gets well with the above treatment of the lids; when it is severe, atropine should be given, either by itself as drops or ointment, or in combination with the copper drops. If it persist, it may need special treatment with jequirity, the jequiritol serum, *x* rays, or peritomy.

Ulceration of the Cornea must be treated on ordinary lines. (*See* CORNEA, DISEASES OF.) Atropine should be given, but neither the copper stick nor the solution of sublimate in glycerin should be used. Nitrate of silver, on the other hand, is not contra-indicated.

For treatment of entropion and trichiasis, *see* EYELIDS, DISEASES OF.

For shrinking and xerosis of the conjunctiva, little or nothing can be done beyond trying to relieve the patient by bland oily or mucilaginous applications, such as paraffinum liquidum.

Spring Catarrh.—Treatment in this condition has in the past been of little avail, but recently some good results have been obtained by means of *x* rays and radium. Apart from these most good is obtained by the use of dark glasses, and of mild astringent lotions combined with adrenalin, e.g., boracic acid 10 gr., zinc sulphate ½ to 1 gr., adrenalin solution (1–1000) 1 to 2 drachms, water to the ounce; or a weak solution of nitrate of silver (1 gr. to the ounce). The latter should not be used for more than two or three weeks lest staining of the conjunctiva be caused.

Xerosis of the Conjunctiva.—

1. Little can be done for those cases associated with severe disease of the conjunctiva (trachoma, pemphigus, etc.), beyond giving oily or mucilaginous preparations.

2. Cases of xerosis associated with degeneration of the cornea (keratomalacia) in marasmic children chiefly need treatment for the general condition, and locally, hot applications to improve the nourishment of the cornea, boracic bathing, and eserine drops, 2 gr. to the ounce.

3. Cases in which neither conjunctiva nor cornea is severely affected need only general feeding up, fresh air, attention to the digestion, and maltine and cod-liver oil.

Burns and Scalds of the Conjunctiva (Caustics, etc.).—The chief dangers are ulceration or sloughing of the cornea, and symblepharon.

The conjunctival sac must be washed free from all irritating substances. Great gentleness should be exercised, only warm bland fluids such as boracic or normal saline lotions being used, both for this and for washing away the discharge. If *acid* has burnt the eye, a solution of sodium bicarbonate, 5 gr. to the ounce, is useful at the first washing, to neutralize it.

Whenever a solid caustic, such as lime, has entered the eye, every particle must be removed, under an anæsthetic if necessary. The upper and outer fornix is a site at which the caustic is apt to lodge, and must be specially examined.

The eye must be kept scrupulously clean, and the discharge prevented from collecting behind the lids by frequent irrigation. If the cornea is in danger from pressure of the lids on the swollen conjunctiva, or if the eye cannot be kept properly clean owing to tense swelling of the lids, the external canthus should be divided. Rounds of lint, which have been soaked in hot boracic lotion, just laid over the eyes, are very comforting. In severe cases the patient should be kept in bed.

If there is any ulceration of the cornea, iritis, or cyclitis, atropine ointment, 2 or 4 gr. to the ounce, should be used, sufficient to keep the pupil well dilated. If the cornea is in danger of sloughing, eserine ointment, 2 gr. to the ounce, may be tried. If the opposing surfaces of palpebral and ocular conjunctiva are ulcerated, adhesions (symblepharon) are very liable to occur. These must be prevented by passing round daily a smooth-ended glass rod right into the fornix, and by using oily non-irritating applications,

e.g., atropine ointment, when atropine is indicated by the presence of corneal ulceration, or pure soft vaseline or liquid paraffin. (Boracic ointment is almost always irritating to the conjunctiva.)

Tumours of the Conjunctiva.—*Dermoid Tumours* are excised, the conjunctiva being brought together as far as possible over the resulting wound to prevent the formation of granulations.

Papillomata and *Polypi* are snipped off right to their base; this is then cauterized with either the platinum loop or a sharply pointed stick of nitrate of silver.

Granulations are treated in a similar manner, and if associated with a chalazion which has ruptured, the latter must, of course, be scraped out at the same time.

Epithelioma and *Sarcoma* are very rarely met with, but must be removed thoroughly, allowing a wide margin; or if too extensive for local removal, the eye must be sacrificed.

W. Tindall Lister.

CONSTIPATION IN CHILDREN.—In infants, even when at the breast, constipation is a common trouble. It may be due to deficiency of sugar or fat in the milk, to excess of proteins, or to improper feeding generally, which burdens the alimentary canal with a large and undigested residue, and excites a mild catarrh of the bowels. Regulation of the diet should, therefore, be the first step in the treatment. A nursing mother should be instructed not to put her child to the breast too often, or to quiet it by that means whenever it cries. With hand-fed infants, measures should be taken to prevent a too firm clotting of the curd of the cow's milk by the addition of a third part of fresh barley-water, or by adding to each ounce of the milk one or two grains of citrate of soda. Sufficient variety in the diet is to be insisted upon (*see* VOMITING IN CHILDHOOD), and if there be any want of sugar or fat in the food, a teaspoonful of fresh syrup or cream can be added to the bottle or given pure after the meal two or three times a day.

Costiveness may result from dryness of the stools owing to too little fluid in the food. If this be the case, the food must not be made too thick, and it is well to supplement the meals by some plain water or barley-water. This is especially necessary in warm weather when the skin is acting freely. A stint of water is often shown by diminished secretion from the kidneys and the appearance of sand in the urine. In the summer young children love water, and will drain the whole contents of a feeding-bottle if allowed to do so. Therefore, if the urine be scanty and high-coloured, and especially if sand be found on the diaper or at the bottom of the chamber pan, four or five ounces of cold water (boiled and filtered) should be allowed between meals several times a day. By this means the bowels can often be made regular in a very short time.

Any cause which is sufficient to set up a mild catarrh of the bowels will induce constipation in a young child, for the increased mucous secretion covers the fæcal masses with a slimy coating, so that the muscular wall, in its contractions, slides ineffectually over their surface. For this reason short-coating an infant is often a cause of constipation. As long as the catarrh continues a cure cannot be effected; therefore attention must be paid at once to the child's clothing, his bath, and his general management, so that any error may be righted without delay.

However induced originally, constipation cannot continue long without adversely affecting the peristaltic movement of the bowels. The colon becomes accustomed to be overloaded, and its contents no longer have a stimulating effect upon its lining membrane, so that the muscular contractions begin to flag. In badly nourished infants this sluggishness of movement is combined with actual weakness of the muscular walls; and if to this be added dilatation of the bowel from accumulated fæcal matter and gas, the expulsive force left at the disposal of the patient is small indeed.

For the successful treatment of constipation in the infant this cause of sluggishness of bowel must be kept in mind, and the administration of drugs should be seconded by systematic massage of the abdomen. For this it is seldom necessary to call in the aid of a professional masseuse; an intelligent nurse will soon learn to apply firm pressure with the ball of the thumb round and round the belly in the course of the colon.

In cases where the costiveness is of considerable standing, a cure can rarely be effected without the aid of aperients, for the bowels have to be educated to provide a daily relief. If the accumulation be large it will be necessary to begin with a dose of

calomel, followed after a few hours by a saline aperient; and it may be necessary to supplement the latter by a copious injection of warm water. In ordinary cases, however, watery injections are to be avoided for fear of over-dilating the bowel; it is far better to provoke an evacuation by a suppository of soap or glycerin. Afterwards, to keep up a regular action of the bowels, any mild aperient may be ordered, such as liquorice powder or cascara sagrada, and it is generally advisable to combine the laxative with small doses of nux vomica and belladonna :—

℞	Extracti Cascaræ Liquidæ	♏ x–xx	Glycerini	
	Tincturæ Belladonnæ	♏ iij–v	Aquæ	āā q.s. ad ℥j
	Tincturæ Nucis Vomicæ	♏ ½		

This dose can be given every night. As children vary greatly in their response to laxative remedies, it will be necessary to find out in each case the dose required to produce a satisfactory result. This treatment must be persevered with for weeks or even months, gradually reducing the dose of the aperient as improvement advances, until it can be dispensed with altogether.

In cases where the stools are too dry and the addition of fluid to the food has not been followed by improvement, it is advisable to give a small dose of some saline aperient in the last bottle taken at night, and 10 or 15 gr. of phosphate of soda, or a good tablespoonful of fluid magnesia added to the meal, will be found to have a useful influence in increasing secretion from the mucous membrane. In some cases it is better to combine the saline with a tonic; thus :—

℞	Sodii Sulphatis	gr. x	Acidi Sulphurici Diluti	♏ j
	Quininæ Sulphatis	gr. ¼	Glycerini	♏ xv
	Tincturæ Nucis Vomicæ	♏ ¼	Infusi Calumbæ	q.s. ad ℥j

To be given three times a day.

Many other drugs may be used as alternative remedies to those already mentioned, and if taken regularly may be prescribed in comparatively small doses. Thus, half a grain of sulphur, if taken every night, often has a sufficiently regulating influence upon the bowels. In young infants a small piece of manna dissolved in hot water and strained through muslin may be added to the last bottle of the evening; or a teaspoonful of olive oil, or of liquid paraffin, may be given after the last meal. Phenolphthalein ('laxoin') in ½-gr. doses is also useful. It may be stated that the aperient syrups of commerce, sold under the name of 'elixirs', if they owe their sweetness to sugar, are not fit remedies for children. The syrup of which they are composed quickly becomes stale, and, fermenting in the child's stomach and bowels, is a fruitful source of indigestion and flatulence.

In the case of children after the age of infancy, a regulation of the diet and habits of life forms an important part of the treatment. Certain articles of food—eggs in some children, excess of starch in others—have a constipating tendency. As in the case of infants, a sufficient variety should be enjoined in the diet, and care should be taken that the child is not fed exclusively or almost entirely on starchy and saccharine matters. Mutton, fish, chicken, and green vegetables should all form part of his diet, and he should be led to eat wholemeal bread and take porridge for his breakfast two or three times a week.

In many children, both boys and girls, habitual neglect of the calls of nature induces a habit of constipation which it is not easy to overcome. Regularity in this respect is therefore to be insisted upon, and the child should be trained early to go to stool every morning as part of the daily routine. In school-girls want of exercise may be a cause of costiveness, but this is easily remedied.

To produce an immediate evacuation the same measures may be resorted to as those recommended for infants. Afterwards, if the costiveness is an habitual condition, it will be necessary to prescribe a mild laxative to be taken regularly every evening, so as to recover the habit of a daily stool. The dose must be taken just before the last meal. For this purpose 2 gr. of the extract of cascara sagrada may be given as a pill, combined with ⅙ gr. of extract of belladonna and the same quantity of extract of nux vomica. Excessive dryness of the stools may be modified by giving an ounce or more of a natural

aperient water when the child goes to bed. In obstinate cases of the kind a useful remedy is :—

℞ Sodii Sulphatis	℥ss	Glycerini		ℿxv
Tincturæ Belladonnæ	ℿx	Infusi Sennæ		
Tincturæ Nucis Vomicæ	ℿj	Infusi Calumbæ	āā q.s. ad	℥ss

To be taken before food once, twice, or three times a day. For a child of six years.

If only one dose is taken, it should be given in the evening before supper.

In some cases parents show a singular prejudice against the continued use of laxative remedies. If this be so, we may fall back upon liquid paraffin or the preparation known as 'lenitol'. Either of these will often be found to act sufficiently in cases of mild sluggishness of the bowels if given several times a day in doses of about one teaspoonful. They are not strictly aperient, but, like olive oil, induce a relief to the bowels by their lubricating action upon the lining membrane. They are also antiseptic, and are useful in checking fermentation in the contents of the intestine.

If the bowels have been sluggish and insufficiently relieved for weeks together, there may be a great accumulation, and ordinary aperients yield but scanty results. In such a case a good dose of castor oil will often produce an effect not attained by the most drastic purgatives. If this also fail, we may conclude that the immobility of the bowel is the consequence of spasmodic contraction of the muscular coat of the intestine. For such a condition sedative remedies which relax the spasm are of more service than irritating aperients which tend to confirm it. The best treatment is belladonna given in frequent doses until it produces wide dilatation of the pupil. Children, it must be remembered, take belladonna well. It is best to give one-quarter of a grain of the pure alcoholic extract every two hours, and as a rule, when a decided impression has been made upon the pupils, the bowels are copiously relieved.

If the accumulation have gone on to complete impaction of the bowel, it will be necessary to persevere for some time with enemas, so as to break up the fæcal masses which occupy the sigmoid flexure and rectum. It is best to give first a full dose (2 to 4 gr.) of calomel, followed by castor oil, so as to produce a softening effect upon the masses, and then to use a large injection of thin, warm gruel, containing an ounce of castor oil and half an ounce of oil of turpentine. The injection must be given very slowly, pausing frequently when the distention of the bowel causes discomfort, until this has subsided, and by this means large quantities of fluid can be introduced. A persevering use of this method will succeed in the most obstinate cases, especially if the belladonna treatment be employed at the same time. If the impacted mass occupy the rectum within reach of the finger, it can be broken up by an instrument, or even the handle of an ordinary spoon, and the action of the enema is greatly assisted by this means. Other ingredients may be employed for the purpose of softening and disintegrating the masses, such as brewer's yeast, six to eight ounces used pure, or ten to fifteen ounces of pure olive oil, or eight ounces of ox-gall mixed with an equal quantity of water, as recommended by Dr. W. Murray ; but to be efficacious these injections must be introduced very slowly and gently, so that they may be retained as long as possible. *Eustace Smith.*

(*Revised by R. Hutchison.*)

CONSTIPATION, HABITUAL.—The prevention of **Atonic Constipation** must be sought by inculcating regular habits in the matter of emptying the bowel, insisting on the necessity of taking food which contains a due proportion of cellulose, and on the importance of daily walking or riding exercise, which is perhaps the best natural stimulant of intestinal peristalsis. The importance of green vegetables and fruit as articles of diet is constantly overlooked, so that they form no regular part of the dietaries of children at school or of the inmates of many institutions, while they are regarded as superfluous by a large part of the people who, from motives of economy and time as well as from not understanding their importance, do not give themselves the trouble to provide them. The importance of daily exercise is more generally admitted, and happily with a large part of our population a sufficient amount of walking is still inevitable.

The *Special Diet* that should be used by persons with a tendency to constipation should include either porridge or brown bread, and uncooked fruit or uncooked vegetables, such as salads and cresses, with each meal ; where these articles of food cause indigestion,

it may be impossible to persist in their use, but we may content ourselves by substituting well-cooked green vegetables and stewed fruit, such as pears, apples, figs, and plums.

It is also probable that many constipated persons drink too little water, and that it may be actually necessary to prescribe a certain amount to be drunk in the course of the day, although it should not be hard water. Constipated persons should avoid red wines, should not drink milk with their meals, and China tea may well replace the more astringent varieties from India and Ceylon.

The waters of Harrogate and several other spas are beneficial in chronic constipation, but the type of person which derives most benefit from them is the obese, full-blooded, gouty patient of middle or past middle age, and harm may be done to delicate people. The waters contain chiefly common salt, with a little sulphate of soda and a large amount of sulphuretted hydrogen. Cheltenham waters are highly suitable for the treatment of constipation, as many of the springs contain sulphate of magnesia, sulphate of soda, and common salt; in some respects they compare favourably with the foreign waters which are often recommended; but the wave of fashion has receded temporarily from the Gloucestershire spa.

Although nothing is really equal to the natural exercise of walking and riding, yet, where from age or obesity these become difficult, or there is want of will to persist, they may be in part replaced by regular exercises which can be followed out in the dressing-room or by passive movements. Abdominal massage, alone or combined with electricity, either by making the hand an electrode or by giving a short faradic sitting after or before the massage, or the mechanical kneading of the abdomen performed by a machine in a Zander Institute, such as exists at Bath and at most foreign spas, helps to stimulate peristalsis. Electricity may also be applied by a large flat electrode over the abdomen, through which a slowly interrupted galvanic current of from 5 to 10 milliampères may be passed for ten or fifteen minutes.

Some patients find benefit from the application of a wet abdominal compress worn for some hours.

The Drugs prescribed for constipation are so numerous that it is impossible to name them all; it will be sufficient to draw attention to those which are most used. It is desirable that an aperient should be one which can be taken for a long period of time without doing harm, and therefore we would not include under this head the preparations of mercury, which, although very useful for clearing out the bowel when that may be desirable, are obviously not suitable for daily use. It is also desirable that the aperient used should be one which can be easily regulated, mild in its action, and equal in its effects, so that a given dose may be relied upon to produce only a known effect. On the whole, mineral waters, or the salts which constitute the purgative base of these waters, best fulfil these requirements; but many delicate invalids, especially neurasthenics, find saline aperients depress them. Of these aperients the sulphate of soda is the most pleasant, and is as trustworthy as its less palatable rival, sulphate of magnesia. The plain sulphate of soda may be given dissolved in a small quantity of hot or cold water, with directions to sip it slowly either before getting out of bed, or directly after rising in the morning. A pleasant modification is to use the effervescing form of the powder, but it should be sipped slowly in the same way as the plain salt. The quantity of sulphate of soda to be taken must be regulated by the requirements of each case; about a teaspoonful is usually the best dose to begin with, or a wineglassful of the mineral water.

Phosphate of soda is a mildly aperient salt, which is also sold in an effervescing form; the dose and mode of administration are the same. Sulphate of magnesia, from its bitter taste, is not so popular, but is a very effective aperient, and can be obtained as an effervescing powder. Seidlitz powders are still liked by many patients, although their action is rather uncertain and apt to cause sharp purging. This is probably due to the addition of sulphate of magnesia to heighten their effect. The proper Seidlitz powder should contain only sodium potassium tartrate (Rochelle salt) and sodium bicarbonate with tartaric acid.

Liquid paraffin is now a popular aperient; it has the advantage that it is not absorbed, and acts mechanically by softening the fæces and stimulating peristalsis; but it makes some patients 'bilious'. The dose is from a teaspoonful to a tablespoonful once daily, or more frequently if necessary, before meals.

The vegetable aperients most in favour are the various preparations of senna, cascara, and aloes. Senna is the mildest and, perhaps for that reason, the most popular of these drugs, but has acquired, not altogether with justice, a reputation with the profession for causing griping, which seems only to occur when it is used in large doses; it forms the principal ingredient in the compound liquorice powder (pulvis glycyrrhizæ compositus) and the official confection and syrup. The official preparations are all made from the leaves, but the legumes or pods also contain a purgative principle, and are somewhat extensively used at the present time. Many patients find that a cold infusion (three hours) of from eight to ten of the pods in 3 or 4 oz. of water taken every night at bedtime is a very efficient remedy; or a few of the pods may be stewed with prunes, and then picked out, the prunes and accompanying syrup forming an agreeable mild aperient. The well-known syrup of figs is said to owe its efficacy to a watery extract of senna pods.

The various preparations of cascara sagrada act more powerfully. The fluid extract has a strong bitter taste, which is covered with difficulty by syrup and aromatic drugs. It is, therefore, preferable to prescribe it in capsules or pills. A preparation sold under the name of *cascara evacuant* is free from this objection, as the bitter principle has been removed. The dose of the dry extract is from 2 to 8 gr., and it may be given every night at bedtime or, in obstinate cases, three times a day before meals.

Aloes in its various preparations, especially aloin, is a favourite remedy with many practitioners, and forms, as is well known, the active principle of a large number of pills, in combination with nux vomica or strychnine and belladonna. The dose and modes of administration are so well known that they need not detain us.

Phenolphthalein is regarded by some practitioners as an excellent remedy; the dose is from ½ to 10 gr. It is sold under various names, e.g., laxoin, purgen, etc.

Sulphur is a good laxative, its action being mild and certain, but it has the disadvantage of causing offensive stools. It is contained in the compound liquorice powder to which reference has been made. It is often given in the form of the official confection (confectio sulphuris), either alone or with an equal quantity of the confection of senna. The tablets of guaiacum and sulphur, recommended some years ago by Sir Alfred Garrod, are frequently employed on account of their slight laxative action. A similar combination exists in the well-known Jephson's powder, which is composed of two parts of precipitated sulphur and one part of powdered guaiacum, of which the usual dose is a teaspoonful; it is a rather powerful laxative, although harmless, and may be taken suspended in milk.

Castor oil is well known for its mild and certain effect, but its nauseous taste is an objection to its frequent use, although nothing is better when it is desirable to get the bowels to act after they have been confined for some days; in these circumstances a dose of ½ oz. to 1 oz. is required. Small doses may be given in capsules; in the constipation of old people it acts very well, in doses of ½ to 1 drachm. A better way of giving it is with an equal quantity of glycerin, taken either at bedtime or the first thing in the morning; this mixture is not unpleasant to take, but can be ordered in capsules if preferred. A powdered form of castor oil, pulvis olei ricini, has been introduced quite recently; it is nearly tasteless.

Enemata have never become such popular remedies for habitual constipation in this country as on the Continent, a belief being generally entertained that they ultimately weaken the action of the bowel. Their utility is fully recognized by the profession as a means of emptying the lower bowel in all cases where we are in doubt as to the diagnosis, or suspect the presence of local ulceration, and desire to unload the bowel in the gentlest manner, or where an accumulation of inspissated fæces exists which cannot be expelled. They should also be employed in that form of constipation to which the term *Dyschezia* is now applied, in which the delay in the passage of the intestinal contents is confined to the pelvic colon. Enemata often cause considerable pain, and should, therefore, be given slowly, the quantity being regulated by the feelings of the patient. The use of a long tube passed up the bowel beyond the region that can be explored with the finger is not recommended; if employed, the tube should be of soft rubber like a stomach-tube, but of somewhat greater diameter, and it should be introduced without the use of any force, and never where there is reason to think there may be ulceration of the bowel; it is a

method which always has in it some element of danger, and is rarely, if ever, necessary. An enema should consist of from ½ to 1½ pints of fluid ; this may be plain water, soap-suds, or thin gruel, and to either of these bases may be added 1 oz. of castor oil or glycerin, or 1 oz. of castor oil with ½ oz. of turpentine. The temperature of the enema should be about that of the body. Large enemata of olive oil are sometimes used for softening masses of fæces. Rectal injections of glycerin by means of a vulcanite syringe, the quantity used being about ½ oz., are a popular and effective means of producing an action of the bowels.

All means that involve the introduction of a syringe are obviously inapplicable in cases where there is a tendency to piles, and very frequently after they have been employed for a few days the local disturbance causes so much soreness that, in spite of gentleness and care, other methods of acting on the bowel have to be employed ; but this rarely occurs where the enema is only used once every two or three days, and is not continued for more than a few weeks.

In the treatment of **Spasmodic Constipation** it is necessary to avoid those articles of food previously recommended, on account of their containing a certain proportion of indigestible cellulose in the shape of fibre, seeds, and membrane, which stimulate the muscular coats of the bowel. We must forbid the use of porridge and brown bread, uncooked fruit, and raw vegetables such as salads and cresses, and order even cooked fruit which contains seeds and skins to be passed through a hair sieve. As these cases are invariably associated with neurasthenia, the hygiene and mode of life should be so regulated as to improve the general health. This is undoubtedly best effected by change of scene, with residence in a bracing place ; but if the case be too far advanced to benefit by these means, a complete rest cure of at least three months' duration should be carried out. During this period, general massage of the trunk and limbs is desirable ; abdominal massage does more harm than good, and if permitted at all must be of the very gentlest kind. Gentle rubbing of the abdomen with the hand sometimes seems to relieve pain, but it must be cautiously carried out. Electricity, if employed at all, must only be used in the shape of a weak galvanic current applied by means of a flat electrode large enough to cover the whole of the abdomen. Abdominal compresses and fomentations give relief, and their use may be combined with the rest cure. Liquid paraffin should be tried, ½ oz. at bedtime ; and belladonna (½ gr. of the extract in pill night and morning) is often of great value in relaxing spasm.

Olive oil enemata at the temperature of the body are very soothing to the bowel, as well as effectual in overcoming this form of constipation. Four to eight ounces of olive oil should be introduced slowly into the rectum and if possible retained in the bowel all night, a folded towel being placed between the nates to prevent the bedclothes being soiled.

Robert Saundby.
(Revised by Robert Hutchison.)

CONSTIPATION, SURGICAL TREATMENT OF.—Although it is usual to speak of chronic constipation as though it were a disease, in reality it is only a symptom common to a great number of totally distinct and separate conditions. Constipation results from the intestinal contents being unduly delayed in their passage along the alimentary canal. This delay may occur in any part of the canal, but is most common in the large bowel. It is not possible in these days to consider constipation as a distinct malady, and the first essential must always be to ascertain the cause of the condition.

The treatment of chronic constipation obviously depends upon the conditions underlying it, and the correct method is to ascertain these causes and, if possible, to remove them. The operations which are performed for chronic constipation without reference to the underlying pathological cause cannot be considered as satisfactory or scientific procedures. Before advising operation there should be a clear understanding of the pathological condition at work and the manner in which it is to be benefited.

The cases of chronic constipation which require surgical treatment fall mainly into two classes—chronic obstruction of the bowel, and some cases of atonic constipation.

Before undertaking the surgical treatment of any case of constipation a very thorough investigation of the case should first of all be made. This should include careful observation of the patient, his stools, and general condition, and the results of various aperients upon his bowels, and will require that he should be kept in a nursing home or hospital

for this purpose. In addition to this, careful examination by the *x* rays after a barium meal and also after a barium enema is important. Examination with the sigmoidoscope to exclude any gross lesion in the rectum or sigmoid is also indicated.

The class of case that calls for surgical interference may be roughly outlined as follows: The patient has been under treatment for months or years, but nothing seems to do him any good, and both he and his doctor are in despair. He has spent months at spas without permanent relief, massage only causes discomfort, and only the most drastic purgatives or large enemas frequently repeated will give any relief, and that very often not satisfactorily. In addition, and quite apart from getting the bowels open, the patient suffers from symptoms of what is now called auto-intoxication. That is to say, he never feels well, has a poor digestion, frequent headaches, and his skin is dry and often discoloured, subcutaneous fat has disappeared, and he has lost weight. In such cases it is clear that an operation to attempt to remedy the condition is indicated.

A clear distinction can often be made between cases of obstructive constipation and the atonic form. In obstructive constipation, when the bowels do act, there are frequent small stools accompanied by considerable pain, and the patient suffers from alternating diarrhœa and constipation. The pain is generally referred to some particular part of the abdomen corresponding to the obstruction. Other symptoms referable to the cause of the obstruction will probably be present. In atonic constipation, the bowels as a rule act only as the result of huge enemata, and aperients have no effect whatever. Also the condition is generally accompanied by a great distention of the abdomen with wind.

The condition of auto-intoxication resulting from constipation has attracted a great deal of attention during the last few years, and we may say there are two schools of thought in reference to it. On the one hand we have the school that believes that the only treatment in such cases is completely to remove the entire large intestine, which is a vestigial structure and of little use to the individual, and in the case in question is acting purely as an unnecessary cesspool. On the other hand we have the school that believes that the colon is a useful and valuable part of the intestine, and that operations such as the removal of the colon are quite unnecessary, and in fact wrong. The correct vew is probably, as usual, a compromise between the two. There can be no question that in an extreme case of atonic constipation, where the muscular wall of the colon has completely degenerated, the correct treatment is, if it can be done without undue risk, to remove the entire large intestine after joining the small intestine to the rectum, and this operation has given extraordinarily good results where it has been performed in suitable cases. It often converts a patient who is not only a chronic invalid, but whose life is not worth living at all, into a perfectly normal member of society.

Complete Colectomy.—This operation was first performed for severe cases of atonic constipation by Sir Arbuthnot Lane, and he has published a considerable number of very successful cases. The operation is a very formidable one, and, even in skilled hands, is of necessity accompanied by a not inconsiderable mortality. For this reason it is hardly justifiable except where all milder methods have failed, and in order to prevent a patient from becoming a hopeless invalid.

It is often stated that a patient who has had a complete colectomy performed will suffer permanently from diarrhœa. This, however, is not the case, and patients suffer little, if any, inconvenience from the complete absence of the colon. On the other hand, one of the author's patients, upon whom he performed a colectomy some seven years ago, has to take a slight aperient almost daily.

Short-circuiting.—A number of these cases were treated some years ago by ileosigmoidostomy, but experience has shown that the results of these operations were not satisfactory. The contents of the bowel tend to pass backwards into the transverse colon and cæcum, and in a proportion of the cases caused serious trouble requiring some further operative procedure. Ileosigmoidostomy has on this account been practically given up except as a preliminary to the performance of a colectomy.

Another form of short circuit, which the author has now performed in several cases with great success, is a lateral anastomosis between the most dependent part of the transverse colon and the upper end of the rectum. This operation, by draining the large transverse loop, prevents the accumulation of the intestinal contents, and no backward regurgitation can occur. This operation is not as serious as a colectomy, being

practically unaccompanied by any risk, and in a great many of the cases is as effectual in curing the condition.

Appendicostomy.—This operation has also been performed in serious cases of constipation, and has the advantage that it is free from any risk, and does not cause the patient any inconvenience. The principle is that it allows the patient readily to give large enemata in the same direction as the peristaltic wave, and to keep the large intestine completely washed out with a minimum of inconvenience. In some cases this has given excellent results, but has not always been successful in very bad cases of atonic constipation. It has the advantage that it can easily be done first, and if it fails to give good results the author's short circuit or complete colectomy can subsequently be performed.

J. P. Lockhart-Mummery.

CONVULSIONS, INFANTILE.—Convulsions in infancy and childhood may be considered under the following headings: (1) *Eclampsia neonatorum*; (2) *Predentition convulsions*; (3) *Convulsions during the period of primary dentition*; (4) *Convulsions occurring between primary and secondary dentition.*

1. **Eclampsia Neonatorum.**—Convulsions in the newly-born may be asphyxial, due to supervenosity of blood and venous turgidity arising from prolonged and difficult labour, especially in the first-born. Cyanosis is frequently present in such cases, and the treatment then consists in the application of leeches—one to each mastoid process—or in actual blood-letting.

Willis, in the 17th century, having seen a series of infants in a single family die of convulsions shortly after birth, bled the next arrival at once, and claimed that it escaped convulsions and survived, in consequence of his treatment.

Blood-letting is only justifiable when the infant is obviously healthy, though plethoric. Pallid, puny, and anæmic infants who become convulsed shortly after birth should be treated by warmth, stimulants, and saline injection sub cutem.

Convulsions from Cortical (meningeal) Hæmorrhage at Birth.—Prolonged and difficult labour suggests this cause. Supracortical hæmorrhage, if not fatal, causes various kinds of birth-palsy—spastic hemiplegia, paraplegia, or diplegia, with or without epilepsy, and mental deficiency. Hence, if diagnosed, operative measures are clearly indicated. Unfortunately, focal commencement of fits is not an infallible guide to diagnosis, even when transient local paresis or paralysis of a limb or limbs follows the convulsions. Such paresis must be persistent, or there must be rigidity of the affected limbs, and the convulsions must be invariably of Jacksonian type, in order to justify the diagnosis of cortical hæmorrhage and recommendation of craniectomy.

2. **Pre-dentition Convulsions,** in the absence of traumatism, organic disease of heart, lungs, and kidneys, congenital syphilis, otitis media, and the various forms of meningitis, simple, basic, purulent, and tuberculous, are usually traceable to improper food or overfeeding. A highly neurotic family history suggests predisposition to fits, which may be induced by very trivial disorders of digestion.

Inward convulsions are so called for the excellent reason that the infant is not outwardly convulsed, but merely rolls its eyes, moans or grins, clenches its fists, and draws up its legs at frequent intervals. In some cases, the infant suddenly ducks its head, and doubles up its body or straightens it out, the breath is held for a few seconds, and a scream or moaning cry of pain follows. Consciousness is not lost. Most of the above-mentioned seizures are due to colic.

A dose of castor oil, with a minim or two of laudanum, usually puts a stop to them, and prevents recurrence, if suitable diet be supplied.

3. **Convulsions during the Period of Primary Dentition.**—In healthy children whose gums are also healthy, dentition is a painless process. It is painful only when the gums are tender, swollen, and inflamed. It is then associated with pyrexia, catarrh—nasopharyngeal, mid-aural, bronchial, or pulmonary—and far more frequently with gastro-intestinal disturbance—vomiting, colic, diarrhœa, or constipation. All these conditions may render the gums tender and unhealthy, and so the passage of a tooth gives rise to pain and irritation, and, in neurotic infants, may cause convulsions.

Yet an infant who at one time cuts a tooth with some or all of these symptoms, may cut the next without any discomfort. Hence coincident ailments, rather than dentition itself, are the probable cause of 'teething convulsions'. A fretful, feverish infant is almost

invariably over-fed; thus its sufferings are aggravated and convulsions are induced by colic, not by teeth.

'*Teething Convulsions.*'—When, in the case of convulsions, the gum over an erupting tooth is obviously swollen, tender, and painful, it should be lanced. But gum-lancing without such indications should not be practised. Catarrh and colic are more potent causes of convulsions than dentition. The practice of gum-lancing seems to have been abused when the gums have been generally swollen, dry, tender, and inflamed, as though all the teeth were trying to come to the surface at once. This condition is the result of feverish catarrh, most frequently gastro-intestinal in site. A brisk purge—castor oil is the best—should be given, with a minim or two of laudanum; and a low diet of pure milk, well diluted with barley-water, should be prescribed. Protection from chill is important. Restless, feverish infants who are supposed to be 'merely teething', should not be taken out of their cots to look at the moon on frosty nights.

Earache from middle-ear catarrh is a common cause of symptoms (including convulsions) supposed to be those of dentition. Any infant, except a congenital idiot, will indicate the site of its pain by pulling its ear and rolling its head when suffering from otalgia. If recognized early, blistering to the mastoid process, and hot dry applications to the external ear, will often relieve. A leech to the mastoid process of infants who are robust is effectual. Puncture of the membrana tympani, even when the membrane is not bulging but is merely congested, is sometimes strikingly successful in cases of apparent basic meningitis associated with fits (meningismus).

The generally swollen and tender condition of the gums mentioned above should be treated by scrupulous cleanliness, and by application of glycerin of borax with chlorate of potash, 10 gr. to 1 oz., with which the gums should be gently rubbed. Chlorate of potash also may be given internally in all cases of stomatitis or gingivitis present during dentition.

4. **Convulsions between Primary and Secondary Dentitions.** — Excluding gross meningeal and cerebral diseases as causes after the second year of life, colic from improper or excessive feeding is held to take the first place. Convulsions in such cases are usually regarded as produced by reflex irritation. But they may also depend on absorption of toxins produced by unwholesome and decomposing food. Toxæmic convulsions may also result from severe burns and scalds, and may occur as uræmic symptoms.

Reflex convulsions have been attributed to diseased or impacted teeth, to errors of refraction, especially astigmatism, to diseases of the throat, nose, and ear, to the presence of foreign bodies in the various orifices of the body, to phimosis and balanitis, and to the presence of intestinal parasites.

It is the duty of every practitioner in a case of convulsions to search for any condition which may have lowered general health, and to rectify it if possible. But convulsions are more often the indirect than the direct result of any of the so-called 'reflex irritations' enumerated. In many cases a hopeful prognosis based on the removal of thread-worms or of a prepuce, or the correction of astigmatism, leads only to disappointment. Fits as the result of an exanthem are certainly rare, and when they occur it will usually be found that the child has had them before, or becomes liable to them afterwards. Of psychical causes, fright or shock must be mentioned, and in such cases recurrence may be expected, if not diminution of intelligence.

Infantile Convulsions in General.—Treatment aims at stopping the fits, removing the exciting cause, and preventing recurrence. Hot baths, with or without mustard, and mustard packs, are of doubtful efficacy, but may relieve colic when present. Ice to the head should be used when there is hyperpyrexia, and the patient should be placed in warm water, which should be cooled gradually to 50° or even 40°. In all cases, the lower bowel should be washed out with saline solution (1 drachm to the half pint of warm water). Then a rectal injection of chloral and bromide, 3 to 5 gr. of the former and double or even treble the quantity of the latter, in 2 oz. of water, for a child of six months of age, should be given.

Inhalations of chloroform may be used to allay spasms until the injection has become absorbed. Inhalation of nitrite of amyl is recommended by some, and hydrobromide of hyoscine in hypodermic injection of $\frac{1}{200}$ to $\frac{1}{100}$ gr. is said to be useful in protracted cases of convulsions. It is, however, not free from danger in debilitated infants. Injections

of morphia ($\frac{1}{20}$ gr.) for a child of six months are preferable to those of hyoscine, but should never be repeated within twelve hours. When cyanosis is present, leeching or even venesection should be employed; provided that the infant is fairly strong, $\frac{1}{2}$ to 1 oz. of blood may be abstracted.

Emetics are never advisable, but the stomach should be washed out if there is any suspicion of its containing poison or irritants of any description. Of all emetics mustard is the most dangerous.

Whilst treatment is in progress, the probable exciting cause of the convulsions should be ascertained by observation and inquiry. Whatever this may be, a full dose of calomel or castor oil never does any harm, and often has the best effects when given after the convulsions have ceased. After-treatment consists in keeping the child quiet, and warm or cool, as indicated by the temperature. Attention to diet is of course all-important, for the vast majority of infantile convulsions are set up by gastro-intestinal disturbance.

Reflex sources of irritation, such as nasopharyngeal obstruction, worms, local genital complaints, ear and eye troubles, should be attended to. Rickets should be treated in the usual manner.

Leonard G. Guthrie.

CORNEA, DISEASES OF.

ULCERATION OF THE CORNEA.

A thorough examination of the whole cornea must be made at the first visit. If there is *blepharospasm*, it must be overcome by the instillation of cocaine drops, by the careful use of lid-retractors, or if necessary by giving an anæsthetic. The greatest care must be exercised lest a deep ulcer be perforated by rough manipulation. If there be any doubt as to the limits of the ulcer, it should be defined by staining with a solution of fluorescein.*

The following are the chief points to be attended to: (*a*) Is the ulcer clear or infiltrated?† (*b*) Are the edges sharp or rounded? (*c*) Is the ulcer superficial or deep? (*d*) Is there hypopyon? (*e*) Is the anterior chamber shallow or deep? (*f*) Has the ulcer perforated or not, and if so, is there any anterior synechia or prolapse of iris?

In treating an ulcer of the cornea, we must (1) Remove the cause; (2) Prevent spreading of the ulcer; (3) Keep the conjunctival sac clean; (4) Bandage and give rest and sedative treatment, hot applications, atropine; (5) Attend to the general health.

1. With ulcers of doubtful origin, the lid margins should be carefully searched for *inverted lashes*, which by rubbing the cornea may be the cause of the ulcer; these should be epilated. The upper lid also should be everted and examined for a *foreign body* which may be scratching the cornea.

2. If the ulcer is *infiltrated or spreading, it must be cauterized*, either with the platinum loop (electro-cautery) or with pure carbolic acid. Carbolic acid is preferable in the milder cases; it is more easily obtained, and said to leave less opacity, but in the severe cases the actual cautery is more certain. For this a general anæsthetic is necessary only in children; the cornea can as a rule be rendered quite insensitive by four or five instillations of a 2 per cent solution of cocaine at intervals of two minutes. The ulcer is defined by a drop of fluorescein, all excess of stain being washed away. While cauterizing, the lids are separated and the eyeball steadied with the fingers of the left hand. This is a better plan and less painful than using a speculum and attempting to fix the eyeball with forceps.

If the platinum loop is used, the ulcer is thoroughly cauterized wherever it is infiltrated, and any overhanging edge is burnt away.

If pure carbolic acid is used, the ulcer should first be carefully cleansed with the spud, and any overhanging margin scraped or cut away with the small sharp spoon or with scissors. It is then well dried with a corner of clean blotting-paper, and the carbolic

---

* Fluorescein 8 gr., sodium bicarbonate 12 gr. to the ounce. One drop is instilled into the eye, followed by a few drops of boracic lotion or solution of cocaine. The ulcer stains green.

† An *infiltrated* ulcer is whitish-yellow in colour, either all over or at the spreading margin; its edge is sharp or undermined, the surrounding cornea is stippled and hazy, and the eye is injected.

A *healing* ulcer has, as a rule, a clear base, the surface is bright, and the 'window reflex', though distorted, can be obtained. Its edge is rounded, the surrounding cornea is clear, and the injection is passing off.

acid stippled on with a very small camel's-hair brush, which is only just moistened with the acid. The blotting-paper should be applied frequently to prevent spreading of the acid beyond the edges of the ulcer. In this way the whole ulcerated surface is cauterized, and the effect should be as localized as if it were done with the actual cautery.

3. If there is much conjunctival discharge, the lids should be painted daily with a 2 per cent solution of silver nitrate, only so long as this lasts. The conjunctival sac should be washed out with warm boracic lotion three times a day and the bandage over the eye dispensed with, the eye being protected with a loose flap of boric lint held in position by a bandage round the forehead only. Pressure should be made over the lachrymal sac to see if there is a mucocele (*vide infra*).

4. *Rest* is secured by the use of atropine, which paralyzes the ciliary muscle, dilates the pupil, and prevents the formation of posterior synechiæ. In young people, atropine drops or ointment (4 gr. to the ounce) should be used three times a day to keep the pupil well dilated. With elderly patients, and especially when the anterior chamber is shallow, atropine must be given with great caution, lest we induce an attack of glaucoma. In doubtful cases, homatropine drops, 2 gr. to the ounce, which can easily be overcome with eserine, may be tried tentatively, and, if no rise of tension occur, we may proceed to the use of atropine drops, 1 or 2 gr. to the ounce. If glaucoma complicates an ulcer, eserine must of course be used in place of atropine.

A light *bandage* should be worn, sufficient to keep the lid down and at rest. The only exception to this is when there is profuse conjunctival discharge, when a bandage is contra-indicated (see above).

Hot applications are most comforting to the patient. We can use either hot bathing, hot fomentations, the Japanese muff-warmer, or Maddox's electric pad where low-voltage electricity is obtainable. Hot bathing with a pad of cotton-wool dipped in very hot boracic acid lotion and placed over the closed lid should be carried out four or five times a day for a quarter of an hour at a time, frequent additions of boiling water being made to keep the lotion as hot as can be borne. Hot fomentations are very comforting, and may be applied between the bathings, but unfortunately they soon get cold. They should be made with several layers of boracic lint, a large piece of protective, and plenty of wool. When damp heat causes a sodden condition of the lids, dry heat may be substituted by means of the small muff-warmer or the electric pad.

5. Attention to the general health is most important, especially in phlyctenular keratitis and in chronic ulceration of the cornea, the bowels being regulated, and light nourishing diet and tonics given, and plenty of fresh air.

Simple Ulcer.—Hot bathing, atropine, light bandage, and tonics, are all that is necessary. The patient is not confined to bed unless the ulcer is spreading, or deep and liable to perforate.

Infiltrated Ulcer.—This must be cauterized (*vide supra*) and then treated as simple ulcer. If the ulcer shows signs of spreading after three days, it must be cauterized again.

If a spreading ulcer is complicated with a *mucocele*, and continues to spread in spite of the above treatment and careful daily syringing of the lachrymal sac with 20 per cent solution of protargol, the sac should be excised, or the eye may be lost.

Hypopyon Ulcer.—The patient should be kept in bed, the ulcer cauterized, atropine used six times a day until the pupil is well dilated, and heat constantly applied ; a purgative should be given and the diet regulated.

If the hypopyon increases in spite of treatment it must be let out by paracentesis of the cornea. A general anæsthetic should be given, as cocaine does not anæsthetize an inflamed eye properly ; fixation of the eye is almost unbearable, and the pain after emptying the anterior chamber is very severe. After washing out the conjunctival sac, a broad needle is passed into the anterior chamber, parallel with the surface of the iris, at the lower edge of the cornea—1 mm. inwards from the sclerocorneal junction. The lower lip of the incision is then depressed with the curette, to allow the hypopyon to escape ; if this is sticky and does not come out readily, it may be pulled out with smooth iris forceps, or washed out with sterilized normal saline solution. After the hypopyon has been let out, the repositor is used to make sure that there is no inclusion of iris between the lips of the incision. Atropine ointment is inserted between the lids, fomentations are applied, and the eye is bandaged.

Perforating Ulcer.—If perforation is liable to occur, the patient should be kept in bed, and all manipulations should be very gentle. In cauterizing an ulcer which is about to perforate, the margin should be dealt with first, and finally the base; and it is often a good plan to allow the cautery just to burn through the base and so let out the aqueous and any hypopyon that may be present.

When perforation has occurred and there is prolapse of the iris, the prolapse in most cases should be left alone. When, however, the prolapse is very minute and recent, and there is little or no conjunctival discharge, it may be picked up in the forceps, drawn well out, and cut off close to the cornea, and the iris allowed to retract. This should not be done if the opening in the cornea is larger than 1 mm. in diameter.

When the whole of the pupillary area is entangled in the corneal opening, *secondary glaucoma* will result as soon as the anterior chamber ceases to leak. An iridectomy should be performed in these cases directly the conjunctival sac is clean.

When the corneal scar will not flatten down, an iridectomy should also be performed, freeing the iris, if possible, from the back of the cornea. When owing to the peripheral situation of the adhesion the entangled portion of the iris cannot be freed, an iridectomy is done on one side, or if necessary on both sides, of the entanglement, and the eye kept carefully bandaged till the cornea is thoroughly consolidated.

Blind eyes with staphylomatous corneæ should be excised, or—after thorough evisceration—a glass globe may be sewn into the sclerotic (Mules' operation).

Keratocele.—Sometimes in the floor of an ulcer which has nearly perforated, a small, black-looking protrusion is seen, which is due to a bulging of Descemet's membrane. The ulcer is treated in the ordinary way, and a firm bandage is applied. If the keratocele remain, thus preventing the proper healing of the ulcer, it should be pricked with a broad needle (taking care not to injure the lens capsule), the aqueous evacuated, and the bandage again applied.

Dendritic Ulcer should be cauterized with pure carbolic acid (*vide supra*), and if in three days the ulcer is spreading, it should be cauterized again. In obstinate cases the actual cautery is more effective than carbolic acid.

In **Neuropathic Ulcer,** in which there is loss of corneal sensation, we must be very careful to avoid strong caustics. The eye should be washed out with hot quinine lotion (2 to 4 gr. to the ounce) four times a day, hot fomentations applied, atropine instilled, and the eye carefully tied up: either the hydrochloride or the sulphate of quinine is used, but if the latter, it must be dissolved with the smallest possible addition of weak sulphuric acid. If the ulcer does not get better quickly, the lid margins should be pared and sutured together along their outer halves, to give a greater protection to the cornea.

PHLYCTENULAR CONJUNCTIVITIS AND KERATITIS.

Phlyctenular disease being an indication of lowered nutrition, the main object of treatment must be to improve the general health, in order to cure the disease and prevent recurrence. Large tonsils, adenoids, and rhinitis are frequent concomitants, together with enlargement of the lymphatic glands along the posterior border of the sternomastoid muscle, and should be treated. The child should be given plenty of fresh air and light nourishing food, and, except in the worst cases, he should be allowed to run about out of doors, both eyes being protected by a broad shade or dark glasses. In the initial stages mercury is indicated to cleanse the intestinal tract (hydrarg. c. creta with sod. bicarb., three times a day), followed after a few days by syrup of the phosphate of iron, or malt and cod-liver oil.

Local Treatment.—

Phlyctens of the Conjunctiva.—Hot boracic bathing, followed by application of yellow oxide of mercury ointment, 4 gr. to the ounce, twice a day, and the use of a broad shade over both eyes. The ointment is inserted between the lids with a small round-ended glass rod. When associated, as is commonly the case, with catarrhal conjunctivitis, the conjunctival sac should be painted every other day with 2 per cent silver nitrate till the discharge ceases.

Phlyctens at the Margin of the Cornea.—In addition to the above treatment, atropine, 2 gr. to the ounce, should be added to the yellow oxide ointment till healing

is well advanced; it can then be discontinued. Here also any catarrhal conjunctivitis must be treated as mentioned above.

In those cases in which a marginal phlycten begins to travel across the cornea, dragging a leash of vessels after it (fascicular ulcer), the same treatment is adopted, but the grey advancing crescent must be cauterized, preferably with the actual cautery. These ulcers do not perforate, but if they cross the pupillary area the resulting scar severely impairs vision, so that their career must be checked at the earliest possible date.

Phlyctens of the Cornea proper are dangerous, both from their liability to perforate and from the scars which they leave; indeed, after repeated attacks the whole cornea may become covered with a vascular coat (phlyctenular pannus), which, in addition to the nebulæ left by the ulcers, seriously impairs the sight. In this group it is very important to give soothing treatment till healing has begun. We therefore withhold the oxide of mercury, and give atropine ointment alone, 4 gr. to the ounce, till healing is well advanced. Great attention must be given to the general health, in addition to local treatment, hot bathing, protection from light, etc. If the ulcer is infiltrated it must be cauterized (*see above*, Infiltrated Ulcer).

There is often marked *blepharospasm* in phlyctenular disease, and this is best treated by dipping the face into a basin of cold water and holding it there till the child struggles for breath, once or twice a day, as is necessary. The conjunctiva should be treated with nitrate of silver if there is catarrh, and *cracks* at the outer canthus touched with a sharply pointed stick of nitrate of silver.

INTERSTITIAL KERATITIS.

In the interstitial keratitis due to inherited syphilis, we have to treat not only the cornea, but the iridocyclitis which almost always accompanies the keratitis, and indeed in some cases occurs as an initial phase.

Locally we give dark glasses, hot bathing, and atropine four times a day to keep the pupil dilated and to prevent the formation of posterior synechiæ. The tension should be watched, lest the iridocyclitis cause secondary glaucoma (*see* Glaucoma). The general state of the patient must be looked after, and tonics should be given. Mercury and iodide are of service provided they do not impair the health, but they are, curiously, not of so much use here as in other syphilitic complaints. Neosalvarsan is worth trying, but is often disappointing in its results. Two or three injections should be given, but even after these, in many cases the course of the disease appears not to be affected. Sometimes, however, salvarsan or one of its substitutes seems to cut short the attack and favour the clearing up of the cornea.

In the late stages, when inflammation has subsided, massage of the cornea with yellow oxide of mercury ointment (4 to 8 gr. to the ounce) helps to clear the cornea.

HERPES OPHTHALMICUS.

The common ocular affection in this condition is an interstitial infiltration of the cornea, associated with more or less cyclitis. The cornea is also rendered insensitive to a greater or less extent. Our treatment must therefore be: (1) Protection of the cornea from irritants by a bandage or dark glasses; (2) Sedative applications, such as hot bathing and atropine. (*N.B.*—Unfortunately the cyclitis often raises the tension slightly, and atropine may make this worse; hence it must be exhibited with caution, very weak drops (1 gr. to the ounce) being used at first to see if the tension be increased or not. If it is increased, atropine must be withheld, and we must rely on hot bathing and leeching. If ulceration occurs, similar treatment is adopted.)

General treatment should be directed against any gouty tendency that may be present. In some cases, potassium iodide and arsenic are of service; in others Tweedy's pill does great good:—

℞ Quininæ Sulphatis	gr. j	Extracti Belladonnæ	gr. $\frac{1}{6}$
Calomel	gr. $\frac{1}{10}$ to $\frac{1}{4}$	Confectionis Rosæ	q.s.

To be taken three times a day after food.

The severe neuralgia occasionally met with can only be relieved by morphia; but the use of this must be withheld as long as possible, as the duration of the neuralgia is often prolonged.

CONICAL CORNEA.

The vision is often greatly improved by glasses, especially a high concave or convex cylinder, which may at times give surprising assistance. When glasses are of no use, and both eyes are affected, an operation holds out a good chance of improvement in many cases, either cauterizing the cornea or removing an elliptical portion from the apex of the cone. *W. Tindall Lister.*

CORNS, TREATMENT OF.—Measures for the treatment of this affection may be divided into two groups: (1) Those which get rid of the corns; and (2) Those which prevent their recurrence.

The ordinary treatment for a painful corn is to cut it down as much as possible without causing bleeding, either straight away, or after preliminary soaking with hot water or the application of some chemical, and then for a few days apply some protective dressing such as a corn-plaster, or lint and strapping, until the pain and tenderness have ceased. The patient resumes his ordinary vocation entirely relieved, but after a few weeks or months the corn reappears as before and treatment is required again. Such palliative treatment should not be advised as a routine measure. We should *cure* the corn, i.e., remove it and *prevent its recurrence*, by attention to footwear and rectification of any digital deformities which may be present.

1. **To Remove the Corn.**—The foot is soaked in hot water (105°) for half an hour. The hard part of the corn is rubbed away gently with a manicurist's emery-board, and glacial acetic acid applied to its base: the glass stopper of the bottle is the best applicator to use. As the acid reaches the corn it sinks into it, and two or three contacts will be necessary before the corn is obviously soaked with it from surface to depth. (Care must be taken to apply the acid to the corn only, and not to the surrounding skin, for it will burn normal skin and produce an ulcer.) The corn is then covered with a small circular piece ot indiarubber sheeting the size of a half-crown, cut from the wrist of a rubber glove, and fixed in position by a pad of wool and a few turns of bandage. This is removed and the acid reapplied morning and evening for two or three days, until the site of the corn begins to feel tender, when application of the acid is stopped and the rubber covering used alone. By this time the corn with the immediately surrounding skin is white and dead-looking; after another two days, if not earlier, the core of it can be removed completely by rubbing firmly with a gauze swab. The rubber covering is then left off altogether, and lint spread with boric ointment applied and reapplied twice daily for two or three days more. The surrounding parts soon regain their normal appearance; but if the corn removed has been a very deep one, the hollow or pit in which it lay will take some weeks to fill up with normal skin.

For this treatment to be effective the patient *must not use the foot* while it is being applied. If the corn is inflamed, the inflammation must be entirely relieved by boric fomentations and rest in bed before the treatment can be carried out.

2. **To Prevent Recurrence.**—To do this one must remove the cause producing it, which is *undue pressure*, brought about by contracted or displaced toes, or by incorrect footwear.

A condition is frequently met with, where the toe is hyperextended at the metatarsophalangeal joint and flexed at the proximal interphalangeal one, and when exaggerated, as it often is in the case of the second digit, is known as 'hammer-toe'. The result is that the head of the metatarsal bone becomes unduly prominent in the sole of the foot and the proximal interphalangeal joint on the dorsum; the boot presses on these prominences, and at both spots a corn is formed. No amount of treatment directed to the region of the corn will prevent its recurrence if the contracted state of the toe be not remedied. The extensor tendon of the contracted toe must be divided s ubcutaneously under gas with a fine sharp-pointed tenotome; in a severe and longstanding case it may be necessary to divide the flexor tendons too. Thereafter the toe must be prevented from contracting again by gentle passive stretching morning and evening. If there be present an actual condition of hammer-toe, with distortion of the bones, it must be dealt with by open operation. (*See* HAMMER-TOE.)

If the patient will not submit to any operation, a circular felt corn-plaster, with a hole in the centre for the corn to fit into, is often very useful to protect it from pressure and relieve the pain.

Another common deformity is the overriding of a toe by the one next it; there is not room in the shoe for this double thickness, and a corn forms on the dorsum of the uppermost toe where it is pressed upon by the leather. If this is met with early, and the overriding toe can be easily replaced between its fellows (this must be tested when the patient is standing), it is possible to get rid of the deformity altogether by wearing for some months a soft tape over the toe, the ends of which pass under the adjoining toes on either side, and are brought round again to meet over the offending toe. The junction is effected by a few stitches with a needle and thread. The double loop thus formed can be easily slipped off to allow of a bath being taken, and then replaced (*see Fig.* 14).

Wide enough shoes and stockings are of course an essential part of such treatment.

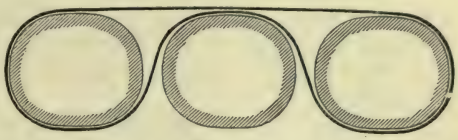


Fig. 14.—Rectification of an overriding toe.

If met with later, when the offending toe cannot be replaced between its fellows while the patient is standing, amputation of the toe is the treatment indicated. In doing this, the base of the proximal phalanx should always be left behind, as it takes part in the anterior transverse arch of the foot, and its absence may weaken the foot considerably. If the patient refuses amputation the toe of the shoe must be specially blocked up to allow for the prominence.

Another condition requires mention: a corn may form in connection with a distorted toe-nail. This usually occurs on the little toe. It is not possible to get rid of such a corn and prevent its recurrence unless the whole of the nail and nail bed are removed; in the case of the little toe this amounts practically to an amputation of the distal phalanx.

Having got the toes straight and removed the corns, it is essential that the patient be fitted with boots or shoes the shape and size of his feet. In examining a patient who comes for advice about corns, one should always begin by measuring and comparing the two feet; very often a gross difference at once reveals the cause of the trouble. The boots then should be made to measure on fresh lasts by a surgical bootmaker. When one foot is a quarter or half an inch longer or wider than the other, a ready-made pair cannot possibly be satisfactory. Boots and shoes as ordinarily worn by the majority of people are too narrow in the tread and are not the shape of the feet, causing excessive pressure at certain points, and consequently corns. The pointed toes and high heels of women's shoes are often blamed as the producers of corns, and to a certain extent they may be guilty; but the pointed shoe is not harmful if the point be placed opposite the big toe, and men, who universally wear low heels, have just as bad corns as women. It is the shape and the fitting of the boots for both men and women that are at fault. Socks and stockings, too, are nearly all made the same shape for the right and left foot, and when tight, as they soon become after a few visits to the laundry, assist in cramping the feet and producing corns. If they cannot be obtained made right and left for our patients, we can at least see that they are big enough.

3. **Soft Corns.**—These occur on the sides of the toes and in the clefts between them, where two skin surfaces are closely opposed, and are often very painful. To cure them the patient must wash his feet twice daily, dry them very thoroughly, especially between the toes, dust powder into the clefts, and put on dry socks. (A good dusting powder consists of talc, boric acid, starch, equal parts.) These corns are due not so much to pressure as to excessive moisture and consequent maceration of the skin. Putting cotton-wool between the toes may increase the perspiration and aggravate the condition.

Mention may be made of a common trouble, sores between the toes, which often have their origin in a soft corn. They should be treated in the same way by frequent drying and dusting with powder; the application of ointments, which increase the moisture, is contra-indicated.

4. **Callosities.**—These are large corns usually forming over the abnormally prominent parts of a deformed foot; treatment should consist chiefly in rectifying the deformity.

Paul Bernard Roth.

COUGH.—(*See* Bronchitis, Chronic.)

CRAFT PALSIES.—In every one of these, whether writer's cramp, or the cramp of pianists, violinists, telegraphists, typists, tailor's cutters, hair-cutters, hammer-men, cow-milkers, watchmakers, harpists, cigarette-makers, etc., etc., we should bear in mind that the craft palsy is essentially a cerebral fatigue ; that it comes on, not during the period when the sufferer is learning his occupation, but when he has become an expert and has to perform his particular skilled movement for prolonged periods at a time. Moreover, the limb is perfectly normal for all movements except that particular one. Thus in writer's cramp the patient is able to use the hand normally in piano-playing or in grasping and using a heavy tool.

Treatment.—This is always tedious. Drugs are valueless, except perhaps an occasional tonic mixture in patients whose general health is below par. Massage, and electrical treatment of the affected muscles, are but palliative at best. In every case, what is essential is complete cessation from the particular movement which has produced the cramp.

In writer's cramp—the commonest and most typical of craft palsies—it is not enough for the patient merely to reduce the amount of his writing ; he must give it up entirely for three months at least. Change of scene and avoidance of worry are easy to prescribe, but often difficult of attainment, inasmuch as the patient's livelihood often depends on that particular movement which brings on the cramp.

During the period in which he is not allowed to use the hand for writing, he may learn to use the other hand for this purpose, or, better, he may learn to use a typewriting machine. But even then, such patients may subsequently develop typist's cramp.

After the three months' rest from writing, the patient may begin to write again, but must employ a different method. A thick cork penholder is often of service, and he should be made to grasp it about its middle, not close to the point. Sometimes it is advisable to place the penholder between the index and middle fingers instead of between the thumb and index. In writing, the elbow must rest on the desk or table, the table must be placed at a comfortable angle, and the patient must write from the shoulder, not from the wrist or fingers. This is sometimes ensured by having a penholder which passes through a spherical piece of cork about the size of a hen's egg, so that the hand grasps the ball and moves *en masse*, fine digital movements no longer being called for.

Other professional neuroses are to be treated on the same lines as writer's cramp, complete rest being the first essential. *James Purves Stewart.*

CRAMP.—In the cramp of **Over-fatigue,** the pain is best relieved by rest, by a hot bath, and by energetic massage, together with passive stretching of the affected muscles. Various liniments, such as liniment of belladonna, of turpentine, of chloroform, or combinations of these, may be employed with benefit, to aid the rubbing and to produce an after-sensation of cutaneous warmth.

In the recurring nocturnal cramp associated with flatulent indigestion, an alkaline carminative draught at bedtime is often effective, e.g. :—

℞	Tincturæ Cardamomi Co.	℥xiv	Spiritus Ammoniæ Co.	℥vj
	Spiritus Chloroformi	℥iv	Aquam	ad ℨviij

℥ij with an equal quantity of water for a dose.

In the cramp of **'Intermittent Claudication'** (dysbasia angiosclerotica) rest is essential (the patient perforce rests while the pain lasts) ; whilst local hot applications, e.g., a hot foot-bath, together with massage, will benefit the pain. In addition to these, iodides and nitrites should be administered internally, in the hope of relaxing the arterial spasm which appears to be one of the underlying causal factors. Erythrol tetranitrate is particularly valuable in such cases. Many patients suffering from intermittent limp are inveterate and excessive tobacco smokers, and this, too, must be corrected.

The treatment of the cramps due to strychnine poisoning, tetany, tetanus, and paralysis agitans is dealt with in other articles. *James Purves Stewart.*

CRETINISM.—The treatment of cretinism in a child is more difficult than that of myxœdema in the adult, as it has to be carried on during the active period of bodily growth and mental development. Ultimate success depends upon the diagnosis being

made, and the treatment commenced, at the earliest possible date. If this is done, and the treatment is adequately and continuously kept up, the child's mental and bodily development should make steady and normal progress equal to that of other children of the same age. If, on the other hand, the disease has been allowed to develop for months or even years without treatment, the arrest of mental development is so great that it is unlikely that the mental powers will ever reach the level which might have been attained if treatment had been carried out from the commencement of the disease. The same does not apply so strictly to the physical development of the child, for it is remarkable what rapid physical progress may be made in a case of cretinism, even of some years' duration, the lost time being largely made up by the unusually rapid rate of growth which takes place under treatment, while mental development lags behind.

The treatment of an early case of cretinism is carried out in much the same manner as that of myxœdema in the adult. At the commencement, a small dose of 1 to 2 min. of liquor thyroidei, or ½ to 1 gr. of dry thyroid in a powder or tablet, should be given each night. The dose may be increased gradually by the addition of 1 min. every week, according to the progress made, until from 5 to 10 or even 15 min. (one to three 2½-gr. tablets) is reached, according to the size of the child. If excessive doses are given, the pulse becomes too frequent, the weight diminishes, pains may be felt in the limbs, the temperature may rise, or diarrhœa may be set up. In some cases the long bones of the legs are liable to become bent during the earlier stages of the treatment. If this should occur, the child should not be allowed to stand or walk for several weeks.

When the cretinism is even of ten or fifteen years' duration, striking results can still be obtained. Larger doses, 3 to 5 min., of the extract may be given from the commencement, the effects being carefully watched. If any tendency to fainting appears, the patient should be kept in bed and very small doses given at first, which may be gradually increased.

When the fullest attainable degree of development has been reached, the treatment must still be continued in sufficient doses to maintain a normal metabolism as long as the patient lives.

Thyroid grafting, when successful, is very satisfactory, as it obviates the need for further treatment. Unfortunately, even human grafts are very apt to fail, and only 20 of Kocher's 93 cases were entirely successful.

The improvement in a cretin under treatment is remarkable, and often rapid. The swelling steadily diminishes and finally disappears, growth is resumed, and may take place very quickly, for as much as six inches has been gained in height in the course of six months. The temperature becomes normal, the skin moist, and the hair grows naturally. In the case of adult female cretins, menstruation becomes established and the mammary glands rapidly develop. After a time, mental development begins to progress, new words are learned, and the range of speech gradually increases. Special methods of education should be adopted, such as are suited to the actual stage of mental development which has been reached, rather than to the actual age of the patient.

George R. Murray.

CROUP.—For the purpose of this article 'croup' signifies catarrhal laryngitis or 'catarrhal laryngeal spasm'. Laryngeal diphtheria, which is sometimes spoken of as *true* croup, is dealt with separately. (*See also* LARYNGITIS.)

1. **Treatment during an Attack.**—The child should be placed in a warm bath, to which mustard is added (1 oz. to the gallon). An emetic should be administered, e.g., 10 gr. powdered ipecacuanha or 1 gr. subsulphate of mercury. Ipecacuanha wine is not trustworthy. The child should then be placed in bed surrounded by an improvised 'tent', into which steam is introduced from a bronchitis kettle. A hot fomentation should be placed over the larynx, plenty of hot liquids given to drink, and 2 gr. of calomel administered. If the stridor does not yield to these measures, and if dyspnœa becomes urgent and retraction of the lower interspaces marked, it may be necessary to proceed to intubation (*see* DIPHTHERIA *and* LARYNGEAL OBSTRUCTION). Should there be the least suspicion that the case may be one of true diphtheria, and not a mere laryngitis, an injection of antitoxin should be given (*see* DIPHTHERIA), and the child carefully isolated.

After the acute stridor has disappeared, the child must be kept in bed so long as there is any hoarseness, steam inhalations being employed for a quarter of an hour at a

time several times a day, and fomentation of the larynx maintained. Five minims each of antimonial and ipecacuanha wine should be administered every three hours.

For two or three nights following an attack, a dose of phenazone (1 gr. for every year of the child's age), or of chloral in similar proportion, should be given at bedtime to prevent recurrence of spasm.

2. **Preventive Treatment.**—In order to prevent recurrence of attacks, the nose and pharynx should be thoroughly examined for obstruction from adenoids, etc., and these dealt with, if found. Exposure to damp air and sleeping in unwarmed rooms should be avoided. The throat and neck should be sponged daily with cold water, and the child gradually accustomed to open air and free ventilation. In weakly or anæmic children, a course of cod-liver oil and iron may be advantageous. *Robert Hutchison.*

CURETTAGE.—(*See* ENDOMETRITIS.)

CUT THROAT.—In cases of suicidal or homicidal cut throat, the condition of the patient usually demands the immediate administration of a hypodermic of morphia. This should be done as the first treatment unless there is serious bleeding or respiratory embarrassment. Severe bleeding must be at once checked. If asphyxia threatens, in cases in which the air-passages are wounded, the wound in the trachea or larynx should be kept open ; or if this fails to relieve or is impracticable, a temporary opening should be made through the cricothyroid space or into the trachea.

When no urgent symptoms are present, the surroundings of the wound should be carefully rendered as aseptic as possible, and the wound itself cleaned and examined to see if the administration of an anæsthetic will be required. When the wound does not extend deeply, this is not necessary ; the wound should be sutured and provision made for drainage for the first twenty-four hours. If examination reveals that the wound is deep, or that important structures are divided, an anæsthetic should be given—chloroform or ether by the open method—and the wound thoroughly explored.

In wounds above the hyoid bone the condition of the muscles of the tongue should be investigated, and, if cut into, the cut edges brought together with chromic gut sutures. The bleeding points must be carefully tied, remembering the position of the lingual and facial arteries and their branches. When the region of the thyrohyoid space is the seat of the wound (the usual spot in suicidal cut throat), the danger of wound of the epiglottis must be remembered ; it may be necessary to suture this structure or to remove a loose portion of it. All oozing must be carefully checked, the wound closed in layers, and drainage provided. If the larynx is involved, divided structures must be carefully united and the wound closed. If, from the nature of the wound or the impossibility of stopping oozing, laryngeal obstruction is feared, a high tracheotomy should be done. Wounds of the trachea, if cleanly cut, may be completely closed, but if the edges are lacerated or contused it is advisable to insert a tracheotomy tube between the stitches for at least the first forty-eight hours. If the œsophagus is wounded, it should be sutured in layers and a tube put down to the suture line. The wound should be well dressed with cyanide gauze, and the patient's head flexed.

Great care is necessary in the *after-treatment*, particularly of cases of suicidal cut throat. The mental condition of the patient must be remembered. A nurse, male or female, must be in constant attendance, a male being preferable for a male patient. Shock may be out of all proportion to the severity of the wound, and may necessitate saline infusions, intravenously or by the rectum. The patient must be encouraged to take food, and in cases in which the base of the tongue, epiglottis, or œsophagus has been injured, food must be given through an œsophageal tube ; if the patient refuse food by the mouth the same method of feeding must be adopted. Sleep must be obtained by suitable hypnotics, and every effort made to improve the general condition.

A careful watch must be kept for signs of respiratory obstruction, and tracheotomy performed if necessary. Early and free incisions must be made in the event of the development of cellulitis of the neck, and drainage provided.

After wounds in the thyrohyoid space an aerial fistula may develop ; this will need a simple operation for closure. Laryngeal and tracheal stenosis may necessitate tubage or tracheotomy.

Aphonia, the result of division of the recurrent laryngeal nerve, may be present. An attempt to remedy this should always be made. As soon as it is seen that no infection of the wound will take place, the ends of the nerve should be sought and suture performed; if it is impossible to find the central end, the peripheral end should be anastomosed to the vagus or spinal accessory, or to a cervical nerve.

Œsophageal and pharyngeal fistula may develop, but usually closes spontaneously.

James Sherren.

CYCLITIS.—(*See* IRITIS.)

CYSTITIS.—Inflammation of the bladder may be either acute, subacute, or chronic, and in all cases is due to infection with micro-organisms, either of a specific type, such as the typhoid bacillus, or the common organisms of suppuration.

Acute Cystitis.—TREATMENT.—Rest in bed is the first indication, with warm stupes or fomentations frequently repeated to the suprapubic region, and the hot sitz-bath two or three times a day. The baths should be taken really as hot as the patient can stand them, from 105° to 110° F. They are best given by placing the patient in a hip-bath, with the body and legs well wrapped in blankets. Hot water should be repeatedly added to keep up the temperature, and the stay in the bath should be from ten to twenty minutes. Upon leaving the bath the patient should be rubbed dry rapidly with hot towels and should return to bed, when the fomentations should be repeated.

The diet must be very light and easily assimilated; spices, peppers, and condiments of all kinds are to be avoided; milk, chicken and veal teas, jellies, broths, custards, and eggs, with light farinaceous foods, are indicated. Alcohol in any shape or form should be absolutely forbidden. Plenty of liquid should be taken, for although this increases the diuresis, and so in the early stages may increase the frequency of micturition, it is desirable to render the urine as fluid and bland as possible. Hence such mineral waters as those of Vichy and Contrexéville are to be recommended, and the milk may be diluted with them in any quantity.

Treatment by Drugs.—The drugs to be ordered vary with the nature of the cystitis, which may be of the acid or the alkaline variety. Very commonly the urine in an acute cystitis is highly acid in the early stages, and tends to alkalinity and ammoniacal decomposition as the case progresses. In such cases there is usually a mixed infection present, the bacteria of ammoniacal decomposition, of which the most common is the *Bacillus ureæ liquefaciens*, only making their presence felt as the cystitis progresses. In some cases an acute cystitis may remain acid throughout. In such cases copious doses of alkalis, together with urinary sedatives, should be given at frequent intervals. A very useful prescription is the following:—

℞ Potassii Bicarbonatis		Tincturæ Hyoscyami	℥xxx
Potassii Citratis	āā gr. xx	Infusi Buchu	q.s. ad ℥j

To be given every three or four hours until some relief is obtained, and then reduced in frequency.

Decoctions of uva ursi and of triticum repens are sometimes very effectual in relieving the scalding pains on micturition.

If vesical tenesmus is really acute, narcotics must be used, and the best way in which to administer them is by a rectal suppository containing ¼ gr. or ½ gr. of morphia, repeated twice or thrice in twenty-four hours. Their administration should cease immediately relief from the most pressing symptoms is obtained. In the acute cystitis of gonorrhœa, and indeed in the majority of cases where the urine is acid in reaction, the oil of sandal-wood in full doses exerts a marked calmative effect. In cases where great nausea is excited by the drug it should be given in capsules, but where the patient is fairly tolerant it exerts its action in the quickest and best manner when given in the form of an emulsion. The writer has found the following formula of great value:—

℞ Olei Santali Flavis Puriss. (recent.)	℥xv	Salol	gr. v
Pulveris Acaciæ (recent.)		Spiritus Menthæ Piperitæ	℥iij
Potassii Bicarbonatis	āā gr. xxx	Aquæ	q.s. ad ℥j

Fiat emulsio.

To be taken every four hours until evidence of its excretion by the urine is strongly marked by its characteristic scent, when the administration should be reduced in frequency.

It is essential that a regular and free action of the bowels should be obtained by the administration of such simple laxatives as compound liquorice powder, confection of senna, or such waters as Hunyadi Janos or Apenta. In addition, a daily enema of plenty of hot water, given very gently and carefully, and really hot, not only assists in emptying the lower bowel, but also is soothing and comforting to the patient.

In those cases where the urine is alkaline almost from the commencement, with an ammoniacal odour and a tendency to the deposition of triple phosphates, the drugs are of a different character. Prominent amongst those of value is hexamine, which should be given in full doses, 10 to 20 gr., three times a day, except in the case of children, where it must be given with care; and its congeners, cystamin, hetralin, and the like. The balsamic drugs, such as benzoate of ammonia and soda, with boric acid and dilute mineral acids, are of value. A drug of great value, when the tendency to deposition of phosphates is very marked, is the acid phosphate of sodium in full doses of 30 to 40 gr. in 3 or 4 oz. of water, repeated every four hours or so. Sandalwood oil without the alkalis will be found of service in such cases.

Treatment by Bladder Washes and Instillations.—In the most acute stages it is best not to use any form of bladder washing by means of the catheter, and to rely upon the methods already indicated; but as the extreme symptoms subside the cure may be accelerated by washing out the bladder with various lotions. The best of these is perhaps silver nitrate solution in very weak strengths.

The bladder should first of all be washed out with boiled water through a No. 10 or No. 12 soft rubber catheter. The eye of the catheter should be large and smooth, and the instrument should be passed with great gentleness. When, owing to prostatic enlargement, there is difficulty in passing the soft catheter, a silk-web coudé catheter of the same calibre should be employed, or sometimes a fully curved metal catheter will be found to meet the difficulty. Whatever instrument is used the greatest gentleness should be exercised, and if spasm of the compressor urethræ muscle hinders the passage of the instrument, it should be combated by the injection of a few drops of a weak eucaine solution into the bulbous urethra. A solution of 4 per cent eucaine is usually quite sufficient. Novocain can be used in rather greater strength, 4 to 8 per cent, as it is decidedly less toxic than cocaine or eucaine.

The boiled water is used for its mechanical properties, to wash away the tenacious mucopus and to allow the astringent and antiseptic solution which follows to exert its full effect upon the bladder walls. Two drachms of bicarbonate of soda to the pint of boiled water is often of service in dissolving the mucopus and cleansing the bladder preparatory to the use of the antiseptic washes. The bladder should be washed until the water comes back clear, and usually one or two pints will be needed for this purpose. It is better to use a smoothly working four- or six-ounce syringe, made of glass or metal, with an asbestos or metal piston, with which to give this lavage. These instruments can be boiled, and the irrigation can be better performed than with the irrigator, or funnel and tube. If preferred, a two-way catheter can be used, but the total calibre of this instrument must be considerably larger, to allow of free ingress and egress of the fluid. Distention of the bladder must stop just short of pain. The bladder having been washed clean, a pint or more of the antiseptic solution should be used.

There are many excellent drugs for this purpose, but the most successful is silver nitrate, in the strength of 2 to 4 gr. to the pint of distilled water to commence with, and increased daily by 1 gr. to the pint until the strength of 10 gr. to one pint is reached. Some patients are much more tolerant than others of this drug, and the strength must be suited to the exigencies of each case.

Lysol ½ to 1 per cent, oxycyanide of mercury 1–10,000 to 1–2000, carbolic acid 1–500, protargol ½ per cent, are all useful. After the use of these drugs the bladder should be washed clean again with boiled water, and a few ounces of the latter allowed to remain.

A recent and very useful, but expensive, drug is argyrol. This should be used in a somewhat different manner. It is practically painless, and after the preliminary washing of the bladder, 2 or 3 oz. of a 5 or 10 per cent solution should be injected into and allowed to remain in the bladder.

Peroxide of hydrogen is often very useful as a bladder wash in strengths of one or two ounces to the pint of water, the 20-volume peroxide of hydrogen being employed. It

should not be used where much pus is present, as much gas is evolved in the bladder in such cases, giving rise to painful and troublesome distention ; but if the pus is first washed away by lavage with sterile water, the peroxide solution can then be used with safety.

Treatment by Operation.—As a rule operation is not required in acute cystitis. In a few cases, however, the inflammation is of the most acute and fulminant type, and within a day or two of the onset of the attacks, sloughs of the vesical mucous membrane come away with the urine, mixed with blood and pus. Pain, frequency of micturition, and tenesmus are acute, and the usual remedies appear to have little or no effect. In such cases the bladder should be thoroughly drained by a suprapubic cystotomy (*vide infra*), and constant irrigation should be instituted.

Subacute Cystitis.—As a rule subacute inflammation of the bladder is the sequel and the closing stage of acute cystitis, but in some cases the inflammatory condition is subacute from the commencement of the illness.

The symptoms differ only in degree from those of acute inflammation. The frequency is much less marked, pain is not nearly so severe, and hæmaturia is very rarely noted.

Treatment is carried out upon the same lines as that of acute cystitis, but intravesical medication may be commenced at once by means of irrigations and instillations through the catheter. Urinary antiseptics and sedatives should be given by the mouth, and it is not necessary to confine the patient absolutely to bed.

Chronic Cystitis.—It is convenient and practical to classify chronic inflammation of the bladder as *Simple*, *Gonorrhœal*, and *Tuberculous*, the first class comprising for convenience all cases of cystitis not due to the gonococcus or tubercle bacillus.

1. *Simple Chronic Cystitis.*—This is seldom met with except as a result of some further disease of the urinary system.

Obstructions to micturition in the form of stricture or prostatic enlargement, trophic changes due to disease of the central nervous system, and constant reinfection from above from a pyelitic or pyelonephritic kidney, are all common causes of a chronic cystitis, whilst vesical calculus is always accompanied by a more or less chronic inflammation of the vesical mucous membrane. But in some cases a chronic cystitis may persist without any of these contributory causes, having as its starting-point enteric fever, pneumonia, influenza, or some general infection of a bacterial character.

A very large proportion of cases of chronic cystitis, arising and persisting without any apparent exciting cause, are found to be due to the presence of bacilli belonging to the coliform group, either alone or in combination with staphylococci. These infections of the bladder by *Bacillus coli communis* are exceedingly intractable, and tend to relapse again and again after apparent cure. In addition to the use of the local measures advised below, the use of a vaccine prepared from the patient's own bacilli in many cases gives great assistance ; but so intractable are these forms of chronic cystitis that a very guarded prognosis as to complete cure should always be given.

Treatment.—As chronic cystitis is in the great majority of cases dependent upon some other condition for its persistence, the treatment must in the first instance be directed to a removal of the cause. The removal of stone from the bladder, the cure of a tight stricture, or the removal of an enlarged prostate, are commonly followed by the cure of the chronic inflammation of the vesical mucous membrane, and the reader is directed to the sections dealing with these subjects for instruction in their treatment.

But sometimes, as already mentioned, no contributory cause can be discovered, and in these cases the chronicity of the infection appears to be due to the imperfect power of resistance of the patient to the particular pathogenic organism. Here the usual local measures must be adopted, consisting of intravesical medication with the various urinary antiseptics, and the patient's general health must be fortified by a generous diet, ample supply of fresh air, and freedom, where possible, from over-fatigue, worry, and anxiety. In these cases the treatment by mineral waters is sometimes exceedingly efficacious, and the choice of a spa should be determined by the alkaline or acid nature of the cystitis. For the former, Bad Wildungen in Germany has for many years had a high and deserved reputation, whilst in cases where the gouty or uric acid diathesis is marked, and the chronic cystitis is always of an acid character, the waters of Contrexéville and Aix-les-Bains often exercise an exceedingly beneficial influence. The question of serum-therapy and vaccines is considered in the section upon tuberculous cystitis (*vide infra*).

2. *Gonorrhœal Cystitis.*—In by far the greater number of cases, gonorrhœa, fortunately, does not attack the bladder; indeed, in many instances the infection travels no higher in the urinary tract than the bulbous urethra. But when the gonococcus gains access to the urethra behind the compressor urethræ muscle, the prostatic mucous membrane, the prostatic follicles, and the mucous membrane of the neck of the bladder become infected. Gonorrhœal infection of the bladder of an acute nature occurs in some cases, and when the acute symptoms have subsided, a chronic infection is sometimes left behind, which usually is limited to the neighbourhood of the trigone and orifice of the bladder. The gonococcus appears to possess an extraordinary vitality and to be able to remain hidden, probably in the crypts and follicles of the prostate, for almost indefinite periods, causing repeated relapses after perhaps long intervals of apparent cure in cases where there has been no possibility of reinfection.

This lurking of the gonococcus in the recesses of the prostate and seminal vesicles undoubtedly explains the constantly recurring attacks of gonorrhœal inflammation of the neck of the bladder, and chronic gonorrhœal cystitis cannot be considered apart from infection of the prostate and seminal vesicles.

The diagnosis of gonorrhœal prostatocystitis having been made, careful and prolonged treatment is necessary, and the treatment of the cystitis must be considered together with that of the urethroprostatic infection. Thus the anterior urethra must be treated by the appropriate measures; all strictures, granular patches, infiltrations, and infected glands of Littré must receive due attention.

The treatment of chronic prostatocystitis consists of instillations and irrigations, combined with the emptying from the prostatic follicles and seminal vesicles of their infected contents by means of rectal massage.

Posterior irrigation should be given by what is usually known as Janet's method. An irrigator can, holding 2 pints or more, with eight or nine feet of rubber tubing, and a conical glass nozzle which will fit the urethral meatus, is all the apparatus that is required. The patient empties his bladder, and the anterior urethra is well washed out with boiled water.

In most cases it is well to inject into the bulb about 30 min. of a 2 per cent solution of novocain. The patient holds this in by compressing the meatus with his fingers for a moment or two. By stripping the solution along the urethra in a backward direction, the surgeon can then force it into the bulb, and by further backward pressure of the fingers upon the bulb, pressing the latter against the arch of the pubes, the solution can be forced into the membranoprostatic urethra through the compressor urethræ. In this way the mucous membrane of the bulb and deep urethra is cocainized. If preferred, this injection may be given by a Guyon's syringe, the little bulb of which is passed down into the deep urethra, and the fluid injected. The object of this anæsthesia is to obviate spasm of the compressor urethræ, which sometimes prevents the free flow of the irrigation into the bladder.

The patient lies on a couch with the irrigator suspended about five or six feet above him. The nozzle is then introduced into the meatus, and the fluid allowed to flow very gently until the whole anterior urethra is ballooned, when, the pressure being gradually increased, the compressor gives way, and the fluid is felt to pass along the urethra and flow into the bladder, the fingers holding the penis feeling a distinct thrill. Deep inspiration and expiration by the patient materially assist this proceeding. As soon as a desire to micturate is felt, the irrigation is stopped, usually when about 10 or 12 oz. of solution have been used. The patient is then placed in the knee-elbow position, and the contents of the prostate and seminal vesicles are expressed by rectal massage. The patient then stands and empties the bladder.

The irrigation should be given each day for about ten days to a fortnight. The best solution to employ is permanganate of potassium, commencing with a strength of 1–5000 and increasing to 1–1000 or 1–500. It must not be forgotten that in these cases the infection is usually a mixed one, and although the gonococcus responds very readily to this solution, other pus-producing organisms may be present, and in these cases, after a rest of a week or so, a further course of irrigation should be given every other day for a fortnight with oxycyanide of mercury solution 1–5000 to 1–2000. Nitrate of silver 1–10,000 to 1–5000 is also of great value. (*See also* Gonorrhœa.)

3. *Tuberculous Cystitis.*—It is now recognized that primary tuberculosis of the bladder is exceedingly rare, and that it is nearly always secondary to renal or genital tuberculosis.

When secondary to disease in the kidney, the orifice of the corresponding ureter shows the characteristic changes, and tubercles and possibly ulceration are found in its immediate neighbourhood. Exceptionally, however, the orifices of the ureters may appear to be normal, but in these cases the result of catheterization of the ureters will produce the necessary evidence, and determine the diagnosis.

Treatment.—Speaking generally, local treatment is not to be recommended. Repeated instrumentation, scraping the ulcers, and repeated washing out or drainage of the bladder are attended by a great risk of infection with other micro-organisms, in which case the discomfort of the patient is greatly increased and the prognosis becomes far more serious.

Scraping of the evident tuberculous patches through a wide suprapubic cystotomy, and under the guidance of a strong light thrown upon them through a speculum, has the disadvantage that only the obvious patches are treated, and the miniature and early tubercles remain to mature in their turn. Indeed, the history of surgical intervention in tuberculous cystitis is one long tale of failure, and it must not be forgotten that the sinuses left by operation frequently become tuberculous, and the urine which was previously acid may become alkaline when infected with other organisms, and phosphatic crusts tend to form and adhere to ulcerated patches and to the wall of sinuses established by operation.

When sepsis has been added to a pure tuberculous infection by improper and dirty catheterism—and by this is not necessarily meant gross surgical uncleanliness, but slight neglect of the stringent aseptic precautions necessary in catheterizing these cases—drainage and thorough irrigation of the bladder may certainly give some relief and remove the more distressing symptoms; but the relief is limited to the sepsis, and cannot be expected to cure the tuberculosis.

Irrigations of, and instillations into, tuberculous bladders meet with no more success from a curative point of view than direct surgical operations, except in so far as they tend to clear up a septic element which may complicate the case. And bearing in mind the ease with which a tuberculous bladder can be infected with organisms of suppuration, it is advisable to limit catheterism and instrumentation generally to the necessities of diagnosis and the relief of retention of urine.

In the event of renal tuberculosis being the origin of the bladder infection, the question of nephrectomy depends largely upon the condition of the opposite kidney. If the latter is healthy, the wisest course to pursue is to remove the diseased kidney by a lumbar nephrectomy, and, by prolonging the incision downwards and forwards, to remove the corresponding ureter as close to the bladder as possible. The ureter should be divided between ligatures, and both ends touched with the actual cautery. It is important to excise the ureter, not only with a view to preventing the formation of a sinus, but also because it would appear that the cystitis may be maintained by infection from a tuberculous ureter. After nephrectomy the cystitis often clears up in a remarkable way, unless the disease in the bladder is very extensive, in which case the prognosis is not good.

In no case should nephrectomy be undertaken without previous catheterization of the opposite ureter, and ascertaining that its kidney is free from tuberculous infection, and sufficiently sound to function adequately when the affected kidney has been removed.

These surgical measures should be followed by a course of tuberculin, which will materially assist the bladder to recover.

If there is no evidence of tubercle elsewhere in the genito-urinary tract, and the cystitis appears to be primary, tuberculin combined with general treatment is indicated, and will give better results than any operative interference.

In cases where the bladder is constantly receiving infection, either from the kidneys above or from the genital system below, surgery has to be called to the patient's aid. Thus, if the patient's condition permits, a tuberculous testis, vas deferens, and seminal vesicle should be removed entirely.

General Treatment of patients suffering from tuberculous cystitis follows well-recognized lines. Just sufficient exercise should be permitted to keep the patient's general health in good order. Cod-liver oil, malt, and fattening foods are indicated, but alcohol

should be diminished, and, wherever possible, entirely prohibited. The bowels should be regulated by mild aperients and, if necessary, enemata. The diet should be easily assimilable and generous. Fresh air, warmth, and avoidance of fatigue and chill are very necessary.

Drugs as a rule have very little effect upon the course of the disease, though pain and frequency of micturition may be relieved somewhat by the use of urinary sedatives. Of these the most efficacious is perhaps the oil of yellow sandalwood, in doses of 10 to 15 min. three times a day. In the case of patients who are unable to assimilate this somewhat nauseous drug, gastro-intestinal irritation is caused by it, evidenced by dyspepsia, nausea, and sometimes a skin eruption. These effects are less likely to ensue if care is taken to obtain only fresh oil of the purest quality.

Henbane in full doses, i.e., ½ to 1 drachm of the tincture, sometimes relieves the pain and frequency, whilst decoction of triticum repens, taken in doses of 4 to 6 oz., makes the urine somewhat more bland and less irritating.

In the later stages of the disease, when a cure is evidently not to be hoped for, opium is the only drug to give relief, and it is neither necessary nor desirable to refuse it. In the form of suppositories of morphia, or by hypodermic injection, it does something to soothe the really acute pain and distress of the closing scenes of this most distressing malady.

John George Pardoe.
(Revised by Hugh Lett.)

DACRYO-ADENITIS and DACRYOCYSTITIS.—(*See* Lachrymal Apparatus, Diseases, of.)

DANDRUFF.—(*See* Seborrhœa.)

DEAF-MUTISM.—(*See* Ear, Diseases of.)

DELHI BOIL.—These chronic ulcers are somewhat intractable. Antimony preparations, especially the tartrate, when given intravenously, have had good results. The initial dose should be ½ gr., gradually increasing till a maximum of 2 gr. for an adult is reached. In children in whom intravenous injection is impracticable, the antimony may be applied in an ointment of 2 per cent of the tartrate in lanolin. Injections of emetine, commencing with ⅛ gr. and gradually increasing to 1½ gr., into the base of the sore cause a local infiltration, and apparently lead, in a proportion of cases, to a permanent cure. Escharotics must be avoided, as more scarring results if these are used. An ointment composed of equal parts of methylene blue, lanolin, and vaseline (Cardamatis' ointment) has proved successful in a number of cases. Some excise the ulcers ; this expedites healing, but the scar may be greater. In very refractory cases an application of the *x* rays, Finsen light, or CO_2 snow, may be necessary. *C. W. Daniels.*

DELIRIUM TREMENS.—(*See* Alcoholism.)

DENGUE FEVER.—There is no specific treatment. Hypodermics of morphia may be required if the pains are severe. Quinine is useless. Low diet and rest in bed are essential. The joint affections are often induced by too early exertion. Hot applications to the affected joints in the early stages give relief, and mild counter-irritants, such as painting with tincture of iodine or iodide of mercury, are useful in the later stages.

C. W. Daniels.

DENTAL CARIES.—(*See* Teeth, Caries of.)

DIABETES INSIPIDUS.—Under this term are included several clinical conditions which differ fundamentally in their pathogeny, but which are all characterized by the passage of an abundant pale urine of very low gravity. Amongst these are : (1) Hysterical and nervous polyuria ; (2) Polydipsia, or the excessive consumption of fluids ; (3) Polyuria, the result of renal insufficiency associated with enlargement of the prostate ; (4) Disease or disturbance of the pituitary gland ; (5) A condition in which, in consequence of some peculiarity in structure or function, the kidney is unable to excrete solids except in high degrees of dilution. Treatment must therefore depend upon an accurate diagnosis of the variety of polyuria with which one has to deal.

In the hysterical and nervous cases, the bromides and valerian (in large doses) are of some use, along with general treatment directed to the nervous system. In polydipsia, e.g., excessive beer or tea drinking, fluids should be restricted. In the pituitary cases, if there is evidence of acquired or inherited syphilis, antisyphilitic treatment should be vigorously pushed; hypodermic injection of 1 c.c. of an extract of the *posterior* lobe of the pituitary lessens the polyuria for a few hours, but the effect soon passes off. Administration by the mouth is useless. In those cases in which the kidney can only excrete solids in high dilution, fluids should not be restricted, but salt and meat should be limited as far as possible. Drugs are of little use in this form, but it is compatible with the maintenance of fair health. *Robert Hutchison.*

DIABETES MELLITUS.—The first step is to determine the presence of sugar in the urine with Fehling's solution. The two solutions, namely, the copper sulphate and the Rochelle salt, should always be kept separate. If this be done, there are hardly any fallacies in the application of the test. If the reagent is made up as one blue solution, it may decompose in time and give a reduction on boiling without the addition of any sugar. Such a single solution, if used, should always be boiled first, letting it stand to make sure that its colour does not change. If sugar is present in the urine, the probability is that the case is one of diabetes.

Gross pancreatic disease, such as tumour or inflammation of the pancreas, may give rise to glycosuria; but these complaints are rare, and are usually associated with copious and fatty stools. In doubtful cases a three days' test on a measured diet, with analysis of the fæces, may be required to determine whether the assimilation of protein and fat is disturbed. Patients also who have had operations in the neighbourhood of the pancreas, such as gastro-enterostomy, or who suffer from some inflammatory lesion in the epigastrium, may pass a few grammes of sugar; but in these cases the amount of sugar is not materially increased by large quantities of carbohydrate food, and, in my experience, the glycosuria does not affect their general health. With the above exceptions the presence of sugar in the urine should be taken as an indication that the patient either has diabetes or is liable to develop that complaint. There is no harm in speaking to the patient of glycosuria, but it is a mistake to say that the glycosuria is not due to diabetes, because those to whom such a remark has been made are apt to neglect their diet, with the result that in a few years health may be seriously affected.

The presence of sugar having been ascertained, the next step is to learn how much there is. The total amount of sugar passed in a day should always be determined. An examination of single specimens is often misleading. Further, the prevalent practice of quoting the percentage only should be avoided, for the concentration of the urine varies much with weather, perspiration, and exercise, and the percentage may be much the same on two days in which the quantity of sugar passed is widely different. The percentage being known, a trifling calculation only is needed to get the total. For example:—

A patient passed 3½ pints of urine, which was found to contain 4 per cent of sugar.
Convert the pints to cubic centimetres:—

1 oz. = 30 c.c. (roughly)
∴ 1 pint (20 oz.) = 600 c.c.
∴ 3½ pints = 2100 c.c.
Then, since 100 c.c. contain 4 grms. of sugar
2100 c.c. ,, 84 ,, ,,

The calculation is much easier if the total quantity of sugar is given in grammes and not in grains.

A Winchester quart can be procured from the druggist, who should be asked to mark the outside of it with bits of stamp-paper or with plain marks on the glass, in pints or, preferably, in half-litres. The patient can then easily read the total amount of urine in the bottle to a quarter of a pint or 100 c.c.

The urine must be tested for diacetic acid with ferric chloride. In severe cases it is an advantage to have the total acid bodies, namely, the β-oxybutyric acid, diacetic acid, and acetone, determined in the urine, as the figures give a good guide to the extent of acid poisoning which has supervened. The determination of the amount of carbon dioxide in the breath also gives in severe cases an indication of the amount of acid

poisoning. Given laboratory facilities, it is easier to do this than determine the total acid bodies in the urine, but the estimation of the latter gives earlier information of the risk of severe acidosis.

Whenever possible, the percentage of sugar in the blood should also be estimated. This requires the services of a trained chemist, but is not a difficult procedure. A good method is that of MacLean (*Biochemical Journal*, July 1919, vol. xiii, No. 2, p. 135). There is usually round about 0·1 per cent of sugar in the blood. In diabetes it may rise to 0·2, 0·25, 0·3 per cent, or more. I have known it as high as 0·4 per cent in a patient who did well with vigorous treatment.

Dietetic Treatment.—

Treatment in the Milder Cases.—If the patient is over 50 years of age, has no active symptoms of diabetes such as thirst, wasting, pains in the legs, or eczema ; if the sugar in the urine does not amount to more than 30 grms. in the day (462 grains, a little more than an ounce) ; and if diacetic acid is absent and the blood-sugar normal, then a simple restriction of carbohydrate in the food is all that is necessary. Such a patient is given a list of foods which he may eat, and a second list of foods which he must not eat except in such measured quantities as are ordered.

The first list (*Table I*) consists of foods containing no carbohydrate (starch or sugar), or small quantities only. In those which contain 1 per cent or more of carbohydrate, the percentage in the food as served at table is given after the food ; e.g., the figure 2 after cauliflower means that boiled cauliflower contains 2 per cent of carbohydrate.

Table I.—Foods which may be Eaten.

Beef, mutton, lamb, pork, poultry, game, sweetbread, tongue, fish, turtle, lobster.
Eggs, butter, cheese—Cheddar, Stilton, American, Gruyère, Dutch, Gorgonzola.
Lard, gelatin.
Starch-free 'breads' ; starch-free biscuits and cakes ; starch-free flour ; sugar-free jellies ; sugar-free marmalade ; sugar-free jams ; sugar-free 'milk'. Starch-free flour may be used in cooking.
Tea, coffee, cocoa.

Liver, 1	Asparagus (boiled), 2	Cream, 4
Sausage (pork), 1	Vegetable marrow (boiled), 2	Tomato, 4
Crabs, 1	Cabbage (boiled), 3	Mussels, 4
Crayfish, 1	Celery (raw), 3	Mixed pickles, 4
Spinach (boiled), 1	Lettuce (raw), 3	Radishes (raw), 6
French beans (boiled), 1	Cucumber (raw), 3	Mushrooms (raw), 7
Kale (boiled), 1	Scallops, 3	Water melon (one slice), 7
Rhubarb (boiled), 1	Oysters, 3	Brazil nuts, 7
Cauliflower (boiled), 2		

Avoid all foods made with flour, and all foods or drinks containing sugar, e.g., chocolate, sweetmeats, lemonade, unless specially ordered.

The second list (*Table II*) consists of foods which must not be eaten except in such measured quantities as are ordered.

Table II.—Foods which must not be Eaten except as Ordered.

The figures after each food show the percentage of carbohydrate which the foods contain as served at table.

Bread, 53 ; rolls, 56 ; scones, 57 ; toast, 61 ; cake, 63 ; gingerbread, 64 ; rusks and biscuits, 75 ; oatmeal, 68 ; oatcake, 63 ; porridge, 8.
Macaroni or vermicelli, boiled, 15 ; rice, boiled, 27.
Milk puddings : tapioca, 10 ; rice, ground rice, sago, semolina, 14.
Custards : made with cream, 3 ; made with milk, 5.
Milk, whole or skimmed, 5.
Potatoes : raw for baking, 18 ; boiled, 21.
Vegetables, cooked : beetroot, broad beans, carrots, leeks, onions, peas (green), turnips, 8 ; parsnips, 12 ; Jerusalem artichokes, lentils, 17 ; peas (dried), 19.
Fruits, fresh : strawberries, lemons, pineapples, cranberries, raspberries, blackberries, oranges, 10 ; gooseberries, currants, apricots, apples, pears, nectarines, cherries, 15 ; figs, grapes, bananas, plums, 20.
Fruits, stewed : apples, apricots, cherries, peaches, pears, 7 ; plums, prunes, 13.
Calvesfoot jelly, 17.
Walnuts, filberts, 13 ; almonds, 17 ; coconuts, 28 ; chestnuts, fresh, 42 ; chestnuts, dried, 74.

The patient, being provided with the above lists, is instructed to make up his diet from *Table I*, but to eat only certain measured quantities of the foods in *Table II*. A

patient of this class may be allowed 100 grms. of carbohydrate a day for a start. In estimating the amount of food from *Table II* which contain 100 grms., *Table III* would be used. This list shows the weights of common foods which contain 10 grms. of carbohydrate. The weights are given to the nearest quarter of an ounce. For weighing the foods the patient should have a letter-scale standing on the sideboard or table, so that he can at any moment weigh an ounce or more of whatever food he is taking. There should be enough weights on the scale to allow of a plate being weighed beforehand when any moist food is to be eaten.

Table III.—Weights of Foods (to nearest ¼ oz.) containing 10 grms. of Carbohydrate.

Bread, rolls, scone, ¾; toast, gingerbread, cake, sponge cake, biscuits, rusks, ½; oatmeal, oatcake, ½; porridge, 4¼.

Macaroni or vermicelli (boiled), 2½; rice, boiled, 1¼.

Milk puddings: tapioca, 3½; rice, ground rice, sago, semolina, 2½; custard, made with cream, 10½; made with milk, 7.

Milk, whole or skimmed, 7.

Potatoes, raw for baking, 2; boiled, 1¾.

Vegetables, cooked: beetroot, broad beans, carrots, leeks, onions, peas (green), turnips, 4½; parsnips, 3; Jerusalem artichokes, lentils, peas (dried), 2.

Fruits, fresh: strawberries, lemons, pineapples, cranberries, raspberries, blackberries, oranges, 3½; gooseberries, currants, apricots, apples, pears, nectarines, cherries, 2½; figs, grapes, bananas, plums, 1¾.

Fruits, stewed: apples, apricots, cherries, peaches, pears, 5; plums, prunes, 2¾.

Calvesfoot jelly, 2.

Walnuts, filberts, 2¾; almonds, 2; coconuts, 1¼; chestnuts, fresh, ¾; chestnuts, dried, ½.

In hospitals it is better to work with grammes alone and not ounces. For convenience a table is inserted here for the conversion of grammes to ounces or vice versa.

Table IV.—Conversion of Grammes to Ounces (1 oz. = 28·35 grms.).

Grammes	Ounces		Grammes	Ounces		Grammes	Ounces	
	Exact	Approx.		Exact	Approx.		Exact	Approx.
5	0·18	¼	55	1·94	2	200	7·06	7
10	0·35	⅓	60	2·12	2	300	10·58	10½
15	0·53	½	65	2·29	2¼	400	14·11	14
20	0·71	¾	70	2·47	2½	500	17·64	17½
25	0·88	1	75	2·65	2¾	600	21·16	21
30	1·06	1	80	2·82	2¾	700	24·69	24½
35	1·24	1¼	85	3·00	3	800	28·22	28
40	1·41	1½	90	3·18	3¼	900	31·75	31¾
45	1·59	1½	95	3·35	3½	1000	35·28	35¼
50	1·76	1¾	100	3·53	3½			

With the aid of *Table III*, 100 grms. of carbohydrate can be made up as follows:—

3	portions of	bread	= 2¼ oz. = 30	grms.	carbohydrate
2	,,	potato	= 3½ oz. = 20	,,	,,
1	,,	porridge	= 4¼ oz. = 10	,,	,,
1	,,	milk	= 7 oz. = 10	,,	,,
1	,,	tapioca pudding	= 3½ oz. = 10	,,	,,
		Total weight	80	,,	,,

These foods supply 80 grms. of carbohydrate; 20 grms. remain over, but as the foods in *Table I* contain some carbohydrate, they may make most or all of this amount. Greens particularly, from *Table I*, must be eaten freely twice a day or more.

Example of a Day's Food containing about 100 grms. of Carbohydrate, 80 grms. of which are added from *Table III*.

Breakfast.—Bread, 1 oz.; porridge, 4¼ oz.; milk, 7 oz.; bacon; tomato, 4 oz.; butter; tea or coffee.

Lunch.—Bread, ½ oz.; meat; cabbage, 6 oz. or more; potato, 2 oz.; milk pudding, 3½ oz.; butter; water or mineral water, mixed, if desired, with unsweetened lime-juice.

Dinner.—Bread, ¾ oz.; fish; meat; cauliflower, 6 oz or more; potato, 1½ oz.; cheese; butter; water, etc., as at lunch.

After the patient has been three days on this food the sugar in the urine should be estimated again. If it has disappeared, a similar diet may be continued, giving the patient a copy of *Table III* and telling him how many items in the day may be taken from it to make up his 100 grms. of carbohydrate, always allowing that 20 grms. are derived from the foods in *Table I*. If at the end of a month he is still sugar-free and the blood-sugar normal, the quantities of food from *Table III* may be increased. But even in the mildest case an examination of urine of the 24-hours' specimen should be made at least once a month.

If sugar is present on a diet containing 100 grms. of carbohydrate, the carbohydrate should be gradually reduced by omitting items from *Table III* until the sugar is gone. The amount of carbohydrate which the patient can take without sugar appearing in the urine gives a measure of the tolerance for carbohydrate at that time. When the tolerance has been determined, a good plan is to allow three-quarters of that amount of carbohydrate on six days in the week, with one 'strict' day, on which only foods from *Table I* are allowed.

On such a '*strict*' diet the patient will probably feel the need of bread more than of any other food. To meet this, various artificial 'starch-free' or 'diabetic' breads are on the market. In the course of a large number of analyses of diabetic breads and foods, we have hitherto found those of Messrs. Callard (74, Regent Street, W.) and of the Protene Co. (36, Welbeck Street, W.) to be what they represent. The same may be said of the diabetic flour of Messrs. Lister, Lexington Avenue, New York. Most of the other breads which have been analyzed have been found to contain so much carbohydrate as to make them unsuitable for use by diabetics, unless the actual proportion of carbohydrate is known to the medical man so that he can allow for it in the diet. There is at the present time a fairly simple rule for the detection of false diabetic breads. If the patient says they are nice and taste like ordinary bread they are generally wrong. The diabetic biscuits of the above makers are usually more palatable than the artificial breads, and easier to carry about. But the best plan is for patients with diabetes to learn as soon as they can to do without bread, eating greens with meat, lettuce and other salads with eggs, and omitting food at afternoon tea altogether.

Milk contains sugar, and cannot be taken unless specially ordered. A useful preparation is the milk, free from sugar, prepared under the direction of Dr. Robert Hutchison and sold in a sterilized form by Messrs. Callard. It may be given diluted with soda-water, tea, or coffee, or made into custard with eggs, and is a valuable addition to the diet.

Example of a Day's Food on a 'Strict' Diabetic Diet.

Breakfast.—Bacon; egg; special bread or biscuits (Callard's or Protene Co.'s); butter; cream, 1 oz.; tea or coffee.

Lunch.—Meat; vegetables from *Table I*; custard (1 egg to 3½ oz. cream), 2 oz.; special bread or biscuits (Callard's or Protene Co.'s); butter; cream, 1 oz.; water or mineral water, mixed, if desired, with unsweetened lime-juice.

Tea.—Tea with cream, ½ oz.; one biscuit (Callard's or Protene Co.'s).

Dinner.—Clear soup; fish; meat; vegetables from *Table I*; omelette; special bread or biscuits (Callard's or Protene Co.'s); butter; cream, 1 oz.; water, etc., as at lunch. Black coffee (without sugar).

In former days diabetics were encouraged to eat as much fat as possible with the object of keeping up their weight. Further knowledge has, however, shown that diabetes can be controlled and its evil effects warded off if the metabolism of the patient is kept at a low level. In the account of the treatment of severer cases this point is treated more fully. It is bad for a diabetic to lose weight if the loss is due to passing large quantities of sugar and being poisoned by acids; but it is not a bad thing for him to be thin if his thinness is due to moderate eating. The metabolism or chemical change of the body is in the former case disorganized by the disease; in the latter it is often normal in quality because it is kept at a low level. Fat must, of course, be taken to replace the carbohydrate which now forms only a small part of the diet, but the patient should be instructed to take it in moderation, and not to aim at increasing his weight.

In such mild cases as we are considering, the danger is that, owing to the patient becoming sugar-free easily and being able to take a moderately liberal diet, he is apt to neglect his complaint and cease to send regular specimens of urine, until, after the lapse of some years, the disease having progressed in severity, his strength and nutrition begin to fail and much more stringent measures have to be taken. Many sufferers from diabetes would be in a better state to-day if reasonable control had been kept over the complaint from the time that sugar was first discovered in the urine.

Treatment by Low Diet in the more Severe Cases.—In more severe cases, in which the sugar is present in larger quantities, diacetic acid is present, or the blood-sugar is raised, the patient should be treated by a low diet, with or without 'fasting' or 'liquid-diet' treatment.

Dr. F. M. Allen, of the Rockefeller Institute, New York, found in dogs, in which diabetes had been induced by excision of the pancreas, that the disease was profoundly modified by fasting. In diabetes in man, also, fasting (1) reduces the blood-sugar to or towards its normal proportion, with disappearance of sugar from the urine, (2) reduces acidosis rapidly. In most cases these good results may be maintained and the complaint held in check for an indefinite time by keeping the total quantity of food small and by controlling in the diet the proportion not only of carbohydrate but of fat and protein. The patient should live at a low level of nutrition and not try to put on weight. At the beginning of treatment he must be under close care and observation, the food being prescribed daily by the doctor, with daily analysis of urine, and, if possible, estimations of blood-sugar weekly or twice a week. A suitable diet once established, many patients can be taught to control the régime for themselves under the general supervision of their medical adviser. For the following outline of treatment the writer is indebted to the writings and verbal communications of Dr. Allen and Dr. E. P. Joslin. The *Diabetic Manual* of the latter (2nd ed., Lea & Febiger, Philadelphia and New York, 1919) is written for the mutual use of doctor and patient.

The procedures which may be needed are described in detail below, but, for clearness, will be summarized first.

1. The first step in a case previously untreated is to reduce fat in the diet. This lessens the risk of acidosis and diminishes greatly the total value of the food.

2. A fat-free diet of twice-boiled greens with some protein (as fish and chicken) until the urine is sugar-free and the blood-sugar reduced.

3. Increase of carbohydrate as greens, fruit, and then oatmeal until sugar appears. Avoid bread unless at least 50 grms. of carbohydrate can be taken without sugar appearing in the urine.

4. Gradual increase of protein until the patient is receiving 1 to 1·5 grms. for each kilo. of body-weight (in children 2 to 3 grms.).

5. When a diet of greens, orange, oatmeal (if tolerated), and protein has been established without sugar or acid bodies in the urine, then add fatty foods gradually until the total food per diem yields 20 to 30 calories per kilo. body-weight.

6. If after a low-fat diet with protein—(2) above—sugar is still present, or if at any stage it reappears, fasting is advised until the urine is free from sugar for twenty-four hours.

For the construction of the diets, daily estimation is required of the protein, carbohydrate, and fat of the food. With the aid of the following tables this is by no means difficult. Indeed, anyone who has done it, say, three days running, will find it easy thenceforward.

Estimations once or twice a week of the blood-sugar, also occasionally of the blood-fat, are a great help in all cases, but in many are not essential.

The following table (*Table V*) is constructed with the object of reducing the calculations to a minimum. The food is supposed to be weighed in ounces, and the total gives the composition of *one ounce* of all the common foods, in the state in which they are usually served at table. Thus, to find out the carbohydrate, protein, fat, or calories in 3 (or any other number of) ounces of any food supplies, all that is needed is to multiply the figures given in the table by 3 (or other number).

Table V.—Showing the Energy Value, and the Amount of Protein, Carbohydrate, and Fat in One Ounce (30 grms.) of Ordinary Foods (*adapted from Joslin*).

Foods as served (edible part only).		Calories	Protein	Carbo-hydrate	Fat
			grms.	grms.	grms.
Meat.—	Lean beef, mutton, or veal (cooked)	64	9	—	3
	Chicken, duck (cooked)	72	9	—	3·6
	Roast beef or mutton, including fat ..	91	6	—	7
	Bacon (grilled)	193	3	—	20
Fish.—	Cod, haddock, hake, whiting (boiled)	25	6	—	0·2
	Oysters, 'solids' (raw)	16	2	1	0·4
	Halibut, plaice, sole (boiled) ..	29	6	—	0·6
	Herring, salmon, turbot (boiled) ..	56	7	—	3
Vegetables Boiled in two waters	2 *per cent group.*—Asparagus, cabbage, cauliflower, French beans, kale, spinach, vegetable marrow ..	5	0·5	0·5	0·1
	8 *per cent group.*—Beetroot, broad beans, carrots, leeks, onions, peas (green), turnips	13	0·5	2·4	0·1
	Lentils, peas (dried)	33	2·5	5·3	0·1
Fresh	Lettuce, tomato	7	0·3	1·1	0·1
Milk, whole (in 30 c.c.)		22	1	1·5	1·2
,, skimmed (in 30 c.c.)		11	1	1·5	0·1
Cream, 25 per cent fat		78	1	1·3	7·5
Egg, boiled (average weight with shell, 58 grms.) (one egg)		80	6·5	—	6
White of one egg (raw)		18	4	—	0·1
Butter		238	0·3	—	25
Cheese: Cheddar, Stilton, American, Gruyère, Gorgonzola		121	9	—	9
,, Dutch, Parmesan		94	11	—	5
Bread, white		81	3	16	0·4
,, ,, toasted		94	4	19	0·5
Callard's white bread		103	8	0·5	7
Callard's 'Prolacto' bread		133	15	—	7·5
Potato (raw for baking)		25	0·7	5·4	—
,, (boiled)		29	1	6	—
Oatmeal (raw)		123	5	20	2
Porridge		14	0.6	2·5	0·2
Rice (boiled)		37	1	8	—
Macaroni or vermicelli (boiled)		22	1	4·5	—
Milk puddings: tapioca		27	1	4	0·5
,, ,, rice, ground rice, sago, semolina		29	1	4·4	0·6
Custard made with cream		65	2	1	6
,, ,, ,, milk		28	2	1	2
Fruits.— *Fresh*	10 *per cent group.*—Blackberries, cranberries, lemon, oranges, pineapple, raspberries, strawberries ..	15	0·3	2·8	0·2
	15 *per cent group.*—Apples, apricots, cherries, currants, gooseberries, nectarines, pears	19	0·2	4·2	0·1
	20 *per cent group.*—Bananas, figs, grapes, plums	29	0·4	6	0·2
Unsweetened	Stewed apples, apricots, cherries, peaches, pears	9	0·2	2	—
	Stewed plums, prunes	17	0·2	4	—
Nuts.—	Brazil	216	5	2	20
	Walnuts, filberts, almonds ..	212	5	4	19

RECIPES :—
Porridge.—1 oz. oatmeal to make 9 oz. porridge.
Custard (cream).—1 egg to 3½ oz. cream.
,, (milk).—1 egg to 5 oz. milk.
Milk Puddings.—Tapioca : 5 oz. tapioca soaked in ½ pint of water (all of which is absorbed), 2 pints milk added, and baked for one hour.
,, ,, Rice, ground rice, sago, or semolina : 5 oz. cereal and 2 pints of milk baked for one hour.

Vegetables form an important part of the diet, and a knowledge of which of them can be used and the different ways in which they can be cooked makes all the difference in the success of the diet and the comfort of the patient. The '2 per cent vegetables', when boiled twice (the first water being thrown away), may be eaten freely, and should be relied upon to check hunger, indeed to take the place of bread in an ordinary diet. Lettuce and tomato are valuable for eating raw, alone or in salads. Boiled tomato contains roughly the same percentage of carbohydrate as raw.

Table VI gives the correspondence between pounds and kilos. closely enough for the purpose of estimating the amount of food per kilo. body-weight.

Table VI.—CONVERSION OF STONES AND POUNDS TO KILOGRAMMES.

St.	Lb.	Lb.	Kg.	St.	Lb.	Lb.	Kg.	St.	Lb.	Lb.	Kg.
7	0	98	44·5	9	0	126	57·2	11	0	154	69·8
7	2	100	45·4	9	2	128	58·1	11	2	156	70·8
7	4	102	46·3	9	4	130	59·0	11	4	158	71·7
7	6	104	47·2	9	6	132	59·9	11	6	160	72·6
7	8	106	48·1	9	8	134	60·8	11	8	162	73·5
7	10	108	49·0	9	10	136	61·7	11	10	164	74·4
7	12	110	49·9	9	12	138	62·6	11	12	166	75·3
8	0	112	50·8	10	0	140	63·5	12	0	168	76·2
8	2	114	51·7	10	2	142	64·4	12	2	170	77·1
8	4	116	52·6	10	4	144	65·3	12	4	172	78·0
8	6	118	53·5	10	6	146	66·2	12	6	174	78·9
8	8	120	54·4	10	8	148	67·1	12	8	176	79·8
8	10	122	55·3	10	10	150	68·0	12	10	178	80·7
8	12	124	56·2	10	12	152	68·9	12	12	180	81·6

In order to give examples of the diets in detail and the way they are prescribed, we may now take an imaginary case in which all the above dietetic procedures are supposed to be needed.

1. For the first step, namely, reduction of fat, tell the patient to take 4 oz. of bread and 8 oz. of potato, and half a pint of milk, in the day, making up the rest of the food from fish, lean meat, green vegetables, and an orange. For example :—

Breakfast.—Fish (but not salmon, herring, or turbot), tomatoes, tea or coffee, bread 1 oz., milk 1 oz.
Lunch.—Lean meat, green vegetables, potato 4 oz., bread 1 oz.
Tea.—Tea or coffee, milk 1 oz., bread 1 oz., tomato or salad.
Dinner.—Fish (as at breakfast), lean meat, green vegetables, potato 4 oz., bread 1 oz., milk junket 8 oz.

2. Assuming that sugar persists after three days on (1), pass on to (2), a diet of twice-boiled greens, fish, and chicken, of low food value, with a minimum of fat, but containing enough protein for immediate bodily needs. For example :—

	Breakfast grms.	Lunch grms.	Dinner grms.	Total grms.	Calories	Protein grms.	Carbohydrate grms.	Fat grms.
Vegetables, 2 per cent	210	210	210	630	105	10·5	10·5	2
Fish	180	—	180	360	300	72	—	2
Chicken	—	90	—	90	216	27	—	11
					621	109·5	10·5	15

The vegetables would be varied at the meals within the limits mentioned in *Table V*. The fish and chicken may be cooked in different ways, provided no flour or other starchy substance or fat be used in cooking. Pure liquid paraffin may be used instead of oil for

salad dressing, as follows : 1 part of liquid paraffin mixed with 2 parts of white vinegar, and a little pepper and salt added, with a few drops of Worcester or similar sauce, if desired.

With the aid of *Table V* we fill in the last four columns. The foods are prescribed in multiples of 30 grms. (roughly an ounce) to save calculation. For instance, 210 of greens is 7 times 30, and the total for the day of 630 greens is 21 times 30, so that we fill in 21 times the figures for calories, protein, carbohydrate, and fat in *Table V*—namely, calories 105, protein 10·5, carbohydrate 10·5, fat 2. In the same way 360 of fish gives 12 times, and 90 of chicken 3 times the figures in *Table V*. The total calories are 621, and the total protein practically 110 grms.

The patient weighs, say, 9 stone, which we see from *Table VI* = 57 kilos. In calories the diet is, of course, grossly deficient, for it gives only $\frac{621}{57}$ = 11 calories per kilo., about one-half to one-third of what he will ultimately need. He is getting, however, $\frac{110}{57}$ grms. of protein for each kilo., or nearly 2. This is enough for his immediate protein needs. Severer cases cannot tolerate so much protein at this stage without getting glycosuria : in such give less meat and chicken.

The patient will be hungry on this diet and will lose weight ; but the reduction in blood-sugar is accompanied by a feeling of returning health, and the falling sugar in the urine will encourage him to persist. He should be in the open air as much as possible, warmly clothed. Exercise should be taken daily but must be gentle.

After three or four days on diet (2), one of two courses must be taken.

If sugar is present, with or without diacetic acid, the patient should fast as described below under (6). With the suggested preliminary period of reduced diet, one day's fast will often suffice, and it will seldom be necessary to fast more than two or three days. As soon as the urine has been free from sugar for twenty-four hours, pass on to (3) below.

If sugar is absent for three or four days of diet (2), and the blood-sugar is also reduced sufficiently, proceed to (3).

3. Add carbohydrate to the diet, which already contains enough protein. Begin with 10 per cent fruits, then oatmeal, and, after 50 grms. of carbohydrate are taken without causing sugar to appear in the urine, potatoes and, lastly, white or brown bread in suitable cases.

It is convenient to add 10 grms. of carbohydrate at a time, using *Table III*, already given. For example, to diet (2) add the first day 100 grms. of orange at lunch, the second day at breakfast and dinner as well. Any other fruit which is available may be used instead of orange, provided the equivalent quantity mentioned in the table is given. The next day add 120 grms. of beans, peas, or onions.

The patient is now getting 50 grms. of carbohydrate, the diet being as follows :—

	Breakfast grms.	Lunch grms.	Dinner grms.	Total grms.	Calories	Protein grms.	Carbohydrate grms.	Fat grms.
Vegetables, 2 per cent	210	210	210	630	105	10·5	10·5	2
,, 8 per cent	—	60	60	120	52	4	9·2	—
Fish	180	—	180	360	300	72	—	2
Chicken	—	90	—	90	216	27	—	11
*Fruit, 10 per cent ..	100	100	100	300	150	3	30	1
					823	116·5	49·7	16

* Or two-thirds of these quantities of the 15 per cent fruits.

If sugar is still absent. continue to add carbohydrate as oatmeal, potato, and bread, until 100 grms. have been given or sugar appears in the urine, thus determining the tolerance for carbohydrate at that time. Daily tests must be made throughout, and, when sugar is found in the urine, the carbohydrate reduced as much as may be necessary to ensure its disappearance. In many cases a day's fast in bed—see (6) below—is the quickest way of getting rid of the sugar.

4. When the limit of carbohydrate tolerance has been determined, if the patient has been receiving the amount of protein—namely, 1·5 to 2 grms. per kilo., mentioned under (2)—pass on to diet (5). If, however, the case is one of the severer type mentioned under

(2) in which the quantity of fish and chicken was reduced, the protein must be increased first by addition of lean meat, fish, chicken, or white of egg until 1·5 to 2 grms. per kilo., or, in the case of children, 2 to 3 grms. per kilo., are being taken.

5. A diet of greens, fruit, oatmeal (if tolerated), and protein in the form of fish, lean meat, chicken, or white of egg, has been established without sugar or acid bodies in the urine. Such a diet, however, is still deficient in food value. The example given shows that the patient is receiving only $\frac{8}{5}\frac{2}{7}\frac{3}{7} = 14\frac{1}{2}$ calories per kilo. Fatty foods must now be added until the patient is getting from 20 to 30 calories per kilo. body-weight.

For example: In successive steps to the last detailed diet, add butter 10 grms. at breakfast and tea, then replace chicken by ordinary beef or mutton with some fat. Add eggs and then cream.

The diet for every day must be set forth daily beforehand, so that a check is kept on all the food. In the practice of Dr. Allen, and of other American and Canadian physicians using his method, the patient is provided with a card on which he enters all that he takes every day, making the necessary calculations himself to determine the caloric value of his food and the grammes of protein, carbohydrate, and fat.

With the aid of *Table V* we may now increase the last diet by the addition of fat to 30 calories per kilo., when it would stand as follows:—

	Breakfast grms.	Lunch grms.	Dinner grms.	Total grms.	Calories	Protein grms.	Carbohydrate grms.	Fat grms.
Vegetables, 2 per cent	210	210	210	630	105	10·5	10·5	2
„ 8 per cent	—	60	60	120	52	4	9·2	—
Fish	180	—	180	360	300	72	—	2
Beef or mutton with fat	—	90	60	150	455	30	—	35
Fruit, 10 per cent ..	100	100	100	300	150	3	30	1
Butter	10	10	—	20	159	0·2	—	17
Eggs	one	one	—	two	160	13	—	12
Cream	45	—	45	90	234	3	3·9	22
Porridge	120	—	—	120	56	2·4	10·0	1
Potato	—	45	—	45	44	1	9	—
					1715	139	72·6	92

6. *Fasting or Fluid Diet.*—During the fast, clear meat soup with salt, and weak tea without sugar, may be taken freely. A little skim milk may be taken in the tea, but not more than 30 c.c. (2 tablespoonfuls) in the day. The writer usually gives half a pint of tea at breakfast and tea-time, and half a pint of soup at the midday and evening meal-times. Water may be drunk freely, and one or two extra cups of tea or soup if desired.

After a fast, go back to the stage preceding that at which sugar appeared in the urine; then gradually increase the food again, either carbohydrate, protein, or fat as the case may be, and proceed as before.

When a diet has been established which is sufficient for the patient's needs, without glycosuria, he may go steadily on with it. In severe cases a weekly fast is advised as a routine, but in many of the milder ones the fast may be avoided, the patient merely omitting all carbohydrate (except that in the foods in *Table I*) on one day a week. The patient should be encouraged to eat less rather than more. It is better for him to keep thin and feel weak than to allow his diabetes to progress.

The above-outlined method of treating diabetes by teaching the patient to live on a low level of metabolism has led to an enormous reduction in the death-rate from diabetes. In mild, and especially in early, cases, the method is easy to apply and often brilliantly successful for a long period.

In severe cases it is not always possible to give a diet of sufficient food value without the appearance of sugar in the urine. Sugar will sometimes be found with 20, 15, or even 10 calories per kilo. In these my experience is that the best treatment is an ordinary 'strict' diet as described above, free from carbohydrate except that in greens, the patient eating as little as possible, combined with a weekly fast-day. Even in severe cases which

have proved difficult with many variations of diet, such a régime followed steadily for month after month will sometimes be accompanied by considerable improvement. It is, however, a last resort, and should only be used after a most thorough and careful attempt has been made to control the metabolism of the patient by dieting as above described.

It need hardly be said, after what has been written, that for the patient to get the best treatment in diabetes requires much care and attention on the part of both doctor and patient. But if a serious effort is made to grapple with the problem, the difficulties are by no means so great in the majority of cases as might be supposed. The obstacle of the arithmetic, like so many other obstacles, soon becomes less when once a serious effort has been made to cross it.

Beverages.—Sweet wines or aerated drinks containing sugar must not be taken. Rose's unsweetened lime-juice contains only 0·4 per cent of sugar, and may be drunk. The benefit of alcohol in diabetes is uncertain. Many physicians with increasing experience use it less and less ; but when a patient is on a low diet, or when he is on a strict diet, which at the best is somewhat unappetizing, a little dry sherry or diluted whisky or brandy may help him to enjoy the meal more, and does not lead to an increase of sugar in the urine.

Drugs.—No drug is of specific value in diabetes so far as our present knowledge goes. Opium and its derivatives are widely used. They do not actually reduce sugar if the diet is constant, but they relieve the patient's hunger and, in some cases, make him more satisfied with his lot. Their routine use cannot, however, be recommended. If given, probably the best form is codeine, $\frac{1}{2}$ gr., three times a day for a week at a time, with a week's interval between. Other drugs recommended are salicylates, aspirin, uranium nitrate, calcium iodide, and arsenic.

Pancreatic extracts, such as holadin, have also been widely used. The relation of ordinary diabetes to the pancreas is not yet clear. Excision of the pancreas in dogs leads to acute diabetes ; and sometimes that organ is found withered after death from severe diabetes in man, though frequently no change can be observed in it. The islands of Langerhans are thought to be concerned with the internal secretion necessary to normal carbohydrate metabolism. It was hoped that the administration of pancreatic extracts would be of benefit to the complaint, but a large bulk of experimental work has not yet succeeded in demonstrating that any severe case of diabetes has been materially affected thereby. The ground, therefore, for the administration of holadin or other forms of pancreatic extract is not yet cleared ; but they are sometimes thought to do good. In cases of gross pancreatic disease, in which the pancreatic juice is not furnished to the intestine in normal quantity, they are, as would be expected, of greater benefit.

Hygiene.—It is important to be out of doors as much as possible, taking any moderate open-air exercise, provided it is not carried to the point of fatigue. The rooms should be well ventilated, and the windows wide open, day and night. An hour's rest should be taken before lunch and dinner every day when possible. Occupation is good, but should not be worrying or over-tiring. It is better for a diabetic to live on a moderate income with an equal mind than to be earning much larger sums of money with recurring anxieties. He should, if possible, live near his work. Quiet days, in which the strength is not taxed, probably lead in all men, as a rule, to long life ; but in diabetes they are specially beneficial.

Complications.—

Coma.—In advanced cases, any sudden change or anxiety, a tiring journey, or even being confined to bed, is liable to bring on coma. If a severe diabetic is likely to undergo any such strain, precaution should be taken by rendering the urine alkaline with bicarbonate of soda. The onset of coma is preceded for some days by increase in the depth of respiration, which can be observed if the whole chest is exposed and watched for two or three minutes. The bowels must be freely opened at once, using castor oil or calomel if necessary. One teaspoonful of bicarbonate of soda in 5 oz. of water or mineral water should be given every hour by the mouth until the urine is neutral or alkaline. The œdema which may be produced thereby, with an illusory increase of weight, is not of sinister significance, and will vanish rapidly when the bicarbonate is reduced. The diet should be relaxed at once, porridge, arrowroot, milk, or any fluid foods being given. In

cases which have not undergone fasting treatment, the fasting diet of tea and soup, with the addition of a tumblerful of water or other fluid every hour, will often relieve the condition.

When coma is established, an infusion of two or three pints of a solution of 3 per cent of bicarbonate of soda, or of normal saline, often brings about the return of consciousness, seldom, however, for more than a few hours. But I have known patients who have lived a long time after recovering from coma. In such, the urine has been made alkaline every few days by the administration of bicarbonate of soda, one or more drachms three times a day, well diluted, the dietetic treatment having been gradually resumed after the coma had passed off.

Coma was formerly frequent in the experience of those treating large numbers of diabetics; but I have seldom seen it since the treatment of diabetes by low diet, with systematic control of fat and protein, has been followed as a routine.

Boils and *Carbuncles* should be fomented with antiseptic lotions and opened if necessary, general anæsthesia being avoided if possible. *Eczema* and *Pruritus* in the regions exposed to contact with saccharine urine are treated by the use of a dusting powder and sponging with a solution of boric acid. A daily tepid bath or sponging should be used by all diabetics, care being taken to keep the whole body scrupulously clean. Inflammatory complications usually disappear as the sugar in the blood and the urine decreases with treatment. The same may be true of *Retinitis*, also of *Neuralgia* and *Sciatica*, which must receive the treatment appropriate to these complaints.

Phthisis.—In this, and indeed in any other general complaints, the usual treatment should be given. Phthisis sometimes does well if the diet is also controlled.

Nephritis.—As much carbohydrate as possible must be allowed, and the protein lessened, more fat and milk being given.

Constipation.—The use of a low diet with plenty of green vegetables leads to much less constipation than was met with when patients were treated with an abundant strict diet. Paraffin may be used, and the patient should be instructed to take regular exercise. He should make a daily attempt at defæcation at a fixed time. If there has been no motion for two days, castor oil or calomel must be given. A useful saline draught, to be taken every morning if needed, is: 30 gr. each of sodii sulphas exsiccatus and magnesii sulphas exsiccatus, and 5 gr. each of sodii chloridum and sodii bicarbonas.

Diarrhœa.—This is uncommon, but must be treated energetically. The patient is best kept warm in bed, the greens and fruit reduced or omitted, and chalk, decoction of hæmatoxylin, or opium prescribed.

Perforating Ulcer should be treated as described under Ulcers.

Dry Gangrene.—The parts should be carefully dressed and protected from infection.

Moist Gangrene calls for immediate operation.

Anæsthesia in Diabetes.—*General anæsthesia* should be avoided when possible, but, in mild cases which can be got sugar-free, necessary operations can be done without undue risk, provided the urine be made alkaline with bicarbonate of soda beforehand, and kept so for a day or two after the operation. In more severe diabetes with acid poisoning, if an operation is necessary, it should be done under local or spinal anæsthesia; or, if that be not possible, under gas and oxygen, the urine being alkalized throughout.

(The tables in this article were constructed in the main by Mr. A. J. Leigh, B.Sc., who also made many of the analyses of foods.) *E. I. Spriggs.*

DIARRHŒA, ACUTE.—The treatment of acute catarrh of the bowel involves, in severe cases, rest in bed, especially if there be any fever or great weakness. The simplest diet is the best, such as equal parts of milk and lime-water, or milk whey. If the stomach is very irritable, only small quantities (½ to 1 oz.) should be given; and if a stimulant is needed, iced champagne should be tried. After the diarrhœa and pain have disappeared, a little solid food can be added; but hot drinks should be cautiously administered, as they may bring back the purging. Bland animal food is often better tolerated than starchy food; for example, cold chicken broth or chicken jelly, and baked or boiled custard puddings, are preferable to gruels or invalid foods

made from cereals. But as convalescence progresses, ordinary simple diet may be allowed, care being taken that it is bland and well cooked (*see* DIARRHŒA, CHRONIC).

With respect to drugs, one may begin treatment by administering ½ oz. to 1 oz. of castor oil, but frequently when the case comes under notice the whole of the original contents of the intestine have been evacuated, and the indication is to check peristalsis and relieve pain. For this purpose we may employ bismuth, with alkalis and opium or morphine, as in the following mixture :—

℞ Bismuthi Carbonatis		Mucilaginis Tragacanthæ	℥xv
Sodii Bicarbonatis	āā gr. x	Aquæ	q.s. ad ℥j
Tincturæ Opii	℥viij		

Two tablespoonfuls every four hours.

In many cases the opium may be dispensed with, and simple mistura cretæ (B.P.) is all that is required.

In infectious diarrhœa, dilute sulphuric acid is useful in the treatment of adults, but it should be given freely, 10 or 15 min. in 1 oz. water every four hours.

In cases of poisoning, severe pain often calls for the local application of fomentations to the abdomen and the use of morphine by hypodermic injection in sufficient doses to relieve the pain.

Where collapse occurs and the pulse is thready, ½ pint to 1 pint of sterilized normal salt solution (0·75 per cent), at the temperature of the body, may be introduced under the skin of the flank, or intravenous transfusion may be carried out. *Robert Saundby.*
(*Revised by Robert Hutchison.*)

DIARRHŒA, CHRONIC.—As chronic looseness of the bowels may be due to several different causes requiring totally different treatment, the routine use of astringents is specially to be deprecated. This is not the place to consider in detail questions of differential diagnosis, but it should be pointed out that, as a necessary preliminary to treatment, a thorough investigation of the case is essential, embracing analysis of the stomach contents, a minute examination of the stools, both by the naked eye and the microscope, and (in many instances) an exploration of the lower bowel by the sigmoidoscope. Digital examination of the rectum should never be omitted. Only thus can grave errors be avoided and right treatment instituted.

For purposes of treatment, cases may be divided into the following groups :—

1. **Gastrogenic,** in which the primary fault consists in mal-digestion in the stomach, the result usually of a deficient secretion of gastric juice in consequence of chronic gastritis or achylia.

2. **Pancreatic,** the result of a defective secretion of pancreatic juice or the blocking of the pancreatic duct. This form is characterized by white, greasy stools containing much undigested fat, and by great emaciation.

3. **Enteritis,** a catarrh of the small intestine, set up by badly-digested food, by irritants such as alcohol, by chronic infective processes, by chronic congestion the result of impeded circulation (e.g., in cirrhosis), by chill, etc.

4. **Colitis,** of which there are several varieties : (*a*) Chronic catarrhal colitis ; (*b*) Chronic ulcerative colitis ; (*c*) Colitis associated with new growths.

5. **Nervous,** in which the primary fault consists in an exaggerated irritability of the intestinal nerves. In some cases this shows itself in a tendency for the bowels to act immediately after a meal. These are sometimes spoken of as cases of *lienteric diarrhœa.* In others the action tends to occur upon any emotional excitement. Cases of so-called ' morning diarrhœa ' are probably due to the presence of a degree of chronic catarrh of the colon in a nervous subject.

The treatment must be modified according to the group to which the case belongs, but in all cases of chronic diarrhœa not due to gross organic disease some common measures are applicable. In the first place, it is rarely possible to treat such patients in bed, although if that can be done it greatly lightens one's task. Rest in bed alone is indeed often sufficient to cause the looseness of the bowels to disappear, although unfortunately it is only too apt to recur when the patient returns to his ordinary habits. Still, it is sometimes of permanent benefit, and should always be insisted upon in very obstinate cases.

Diet can do much, but it is often necessary to individualize in drawing up the menu ; most patients, too, discover for themselves pretty quickly what articles are injurious. As a general rule, however, the following should be avoided :—

Fruits in any form, nuts, raisins, and currants.
Vegetables.
Whole-meal bread.
Oatmeal.
Honey, treacle, jams, marmalade.
All sour things.
Pickled and preserved foods, smoked meats or fish.
Soups.
Pastry.
Cheese.
Milk (unless well diluted).
All very hot or very cold liquids.

And the diet should consist of such articles as :—

White fish, roast or boiled meats, poultry, game, lightly-cooked eggs.
Stale white bread, toast, rusks, biscuits.
Mashed potatoes, boiled rice, macaroni, vermicelli, etc.
Jellies, custard, plain milk puddings.

Beverages :—Water, barley-water, peptonized cocoa, tea (lightly infused and not taken very hot).

Alcohol should be forbidden, or allowed only in strict moderation and well diluted. The food should be thoroughly chewed, and care taken that the teeth are in good order. It is important also to avoid chill, and a warm abdominal belt (' cholera belt ') should be worn ouside the under-vest in the winter at least.

We may now consider the special treatment required for each variety of chronic diarrhœa :—

1. *Gastrogenic.*—The special dietetic indication here is to reduce the amount of flesh foods, and only to give them finely minced or pounded. Peptonized milk may be used to replace them in part.

Dilute hydrochloric acid should be given in 15-min. doses after meals, with or without pepsin, or acidol tablets (two after each meal with half a tumblerful of water) may be found a more convenient way of giving acid. Acidol-pepsin pastilles are also obtainable. (*See also* ACHYLIA.)

2. *Pancreatic.*—In this variety the amount of fat in the diet should be reduced, and dextrinized or malted foods, e.g., Veda bread, Mellin's food biscuits, or grape-nuts, substituted for starchy products.

The place of the pancreatic juice should be supplied by a good artificial pancreas preparation, e.g., holadin capsules (Fairchild) (one or two about three hours after each meal). An active diastasic ferment may also be given with advantage immediately after any meal containing starch (taka-diastase, dia-malt, diazyme, etc.)

3. *Enteritis.*—The treatment of chronic catarrh of the small intestine is always a difficult matter, and such cases are amongst the most troublesome of all forms of chronic diarrhœa. There are no special dietetic indications beyond those suitable for chronic diarrhœa in general (*see above*). Alcohol must be strictly forbidden. Any co-existing disease (e.g., cirrhosis, renal disease, cardiac disease, phthisis, etc.) must be treated on the usual lines.

Chill should be guarded against with special care. Paradoxical though it may seem, such cases often do best with aperients, and a small dose of Carlsbad salts may be given in a tumblerful of hot water every morning. If, however, the diarrhœa be severe and persistent, it may be necessary to give astringents, the best being preparations of bismuth, calcium, and tannin, e.g. :—

℞ Bismuthi Carbonatis
Calcii Carbonatis
Calcii Phosphatis āā pt. æq.

One teaspoonful three or four times a day.

℞ Tannigen or Tannalbin Tablets gr. v

Two or more thrice daily.

Powdered cuttle-fish bone is also a useful astringent ; it may be given in 20-gr. doses three times daily.

For griping and flatulence, belladonna and menthol are the best remedies, e.g. :—

℞ Mentholis gr. j | Extracti Gentianæ q.s.
Extracti Belladonnæ gr. ss |
Fiat pilula. Two or three times a day.

Great perseverance in treatment is required, as improvement is frequently slow. A course at a spa is often helpful in obstinate cases, Wiesbaden and Homburg being most suitable when there is deficiency of gastric secretion, and Carlsbad, Neuenahr, and Vichy when there is acidity.

4. *Colitis.—a. Chronic catarrhal.*—There is here no special dietetic indication beyond the rules already laid down for chronic diarrhœa in general. The most useful drugs are castor oil in small repeated doses (e.g., 10 min. in capsule or as an emulsion thrice daily), and bismuth (gr. xx. t.d.s.). It is often necessary to add a little opium, especially if tenesmus is troublesome ; compound tincture of chloroform and morphine (5 to 10 min.) is a good form in which to give it.

Lavage of the bowel is often very helpful. One may use either hot normal saline (one or two pints), or a weak solution (½ to 1 per cent) of protargol or argyrol. (*See also* COLITIS.)

b. Ulcerative.—If ulceration of the colon be found on examination with the sigmoidoscope, much the best treatment in the writer's judgement is appendicostomy. (*See* COLITIS, SURGICAL TREATMENT OF.) If it be desired to try medical treatment first, details will be found in the article COLITIS.

c. Associated with New Growths.—Treatment here of course must be surgical. (*See* COLITIS, SURGICAL TREATMENT OF.)

5. *Nervous Diarrhœa.*—The general dietetic rules in these cases are the same as in all cases of chronic diarrhœa, but it is specially important to 'individualize'.

The best drugs on the whole are the bromides (e.g., sodium bromide 12 gr. night and morning), but it may be necessary at times to use opium to enable the patient to feel confidence in his bowel for some particular occasion. Chlorodyne is convenient for the purpose. As far as possible, however, this should be avoided.

In cases of the lienteric type small doses of opium (5 min. of the tincture) before meals are useful, although some writers recommend small doses of Fowler's solution and nux vomica.

In the so-called 'morning diarrhœa' to which reference has already been made, and which is sometimes very obstinate, no fluid should be taken after 6 o'clock in the evening, but the treatment otherwise is the same as for chronic catarrhal colitis. Sulphocarbolate of zinc (2½ gr. in pill thrice daily) has been recommended by some, and so also have small repeated doses of podophyllin (5 min. of the tincture after meals). (*See also* DYSENTERY *and* SPRUE.)

Robert Hutchison.

DIARRHŒA, HILL.—In the more severe form this closely resembles sprue, and similar dietetic treatment is required, though it is not necessary to continue the treatment for so long a period. In the milder forms, a less severe regimen suffices. The Indian authorities advocate the administration of a drachm of liq. hydrarg. perchlor. a quarter of an hour after food, and, two hours later, 10 to 15 gr. of pepsin or ingluvin. If the disease does not readily yield to this treatment, the patient should be sent down to the plains. (*See also* SPRUE.)

C. W. Daniels.

DIARRHŒA, INFANTILE.—Diarrhœa may be acute or chronic.

Acute diarrhœa may be *Catarrhal* or *Septic.*

Catarrhal Diarrhœa constitutes the ordinary simple form of looseness of the bowels to which all infants and young children are so liable. Infants during teething are peculiarly prone to this derangement, for teething sets up pyrexia, and a feverish child is more sensitive than another to changes of temperature.

An ordinary mild intestinal catarrh can be quickly cured by a dose of castor oil to clear away irritating matters from the bowel, followed by a mild astringent mixture. The latter must vary according to the nature of the evacuations.

If the stools are fermenting and acid, an alkali is required. The time-honoured chalk and catechu mixture may be given three times a day; or we may order instead:—

℞ Bismuthi Carbonatis gr. v | Pulveris Cretæ Aromatici gr. j

In a teaspoonful of glycerin and water three times a day.

Ordinary loose fæcal evacuations containing undigested curd of milk yield quickly, as a rule, to:—

℞ Zinci Oxidi	gr. j	Glycerini	℥x
Tincturæ Opii	℥ ½	Aquæ Carui	q.s. ad ℥j

To be given every four hours, following, of course, the necessary aperient.

If, however, they persist, 1 gr. of tannigen may be added to each dose. As alternative prescriptions we may employ:—

℞ Spiritus Ammoniæ Aromatici	℥ss	Glycerini	℥x
Tincturæ Opii	℥ ½	Aquæ Anethi	q.s. ad ℥j
Tincturæ Rhei Compositæ	℥iij		

Or, Every four hours.

℞ Tincturæ Coto	℥iij	Glycerini	
Creosoti	℥ ½	Mucilaginis	āā ℥x
Tincturæ Opii	℥ ½	Aquæ Carui	q.s. ad ℥j

To be taken three times a day.

As long as the stools continue to show the presence of undigested curd, it is advisable to give from time to time a dose of castor oil or rhubarb and soda. At the same time the diet should be reconsidered, and, if thought desirable, the quantity of milk taken at each meal may be reduced, or one grain of citrate of soda may be added to each ounce of milk.

If the stools are foul-smelling, an antiseptic is required. Of these one of the best is a combination of tincture of iodine and glycerin of carbolic acid, ½ to 1 drop of each, given in glycerin and water three times a day; or, if bismuth and chalk are being taken, 1 gr. of salicylate of soda may be added to each dose of the mixture. As alternative remedies we may use;—

℞ Resorcini	gr. ij	Tincturæ Cardamomi Co.	℥v
Tincturæ Rhei Compositæ	℥iij	Aquæ Chloroformi	℥x
Tincturæ Opii	℥ ½	Aquæ Menthæ Piperitæ	q.s. ad ℥j

Or, To be taken three times a day.

℞ Liq. Hydrargyri Perchloridi	℥v	Aquæ Chloroformi	℥x
Tincturæ Opii	℥ss	Aquæ	q.s. ad ℥j

Three times a day.

Green stools, if acid, should be treated with the above bismuth remedy; if alkaline, they yield readily, as a rule, to a teaspoonful of a 2 per cent solution of lactic acid given every hour, or to two or three drops of dilute sulphuric acid given every four hours in a teaspoonful of water.

Whatever be the form of drug employed, it is useful to add to each dose a small quantity (¼ to 1 drop) of laudanum. The sedative delays the peristaltic movement of the bowel and gives the astringent a longer time to act. It is well, however, whenever an opiate is included in the prescription, to warn the attendants that the child is on no account to be waked up to take his medicine.

When the catarrh affects principally the lower bowel, the stools contain visible mucus in large quantities, with blood in patches and streaks from the straining. In this variety, which is often called 'dysenteric diarrhœa', castor oil, opium, and ipecacuanha in small doses are especially indicated:—

℞ Olei Ricini	℥ij	Glycerini	℥x
Tincturæ Opii	℥ss	Aquæ Cinnamomi	q.s. ad ℥j
Vini Ipecacuanhæ	℥j		

To be given every four hours after food.

If in these cases the tenesmus is great and the bowel protrudes during defæcation, a local sedative is indispensable. Two drops of laudanum in a teaspoonful of thin warm

boiled starch must be injected into the bowel after a stool, or a suppository containing $\frac{1}{15}$ gr. of cocaine in 5 gr. of cocoa butter may be used instead, and repeated twice a day.

In cases where the tenesmus is extreme and the prolapsed mucous membrane protrudes as a bright crimson ball, which cannot be retained within the sphincter even for a moment, the projecting part should be first fomented with warm water; then ½ oz. of thin warm boiled starch, containing 3 drops of laudanum and 5 gr. of powdered ipecacuanha, should be injected into the rectum, and the fundament be afterwards covered with a thick poultice of boiled starch. The enema may be repeated twice a day, but the fomentation and the poultice must be renewed after each action of the bowels.

The form of looseness called 'lienteric diarrhœa' requires a different treatment. The looseness is due to exaggerated peristaltic movement of the bowels. The peristalsis is induced by the act of eating, and the stools are preceded by severe griping pains and marked by extreme urgency. An infant while taking his bottle stops sucking, cries in pain, and discharges the stool in a sudden gush. An older child has often to hurry away from the table during the course of a meal. This variety is quickly cured by small doses of arsenic and nux vomica:—

℞ Liquoris Arsenicalis	℥ss	Glycerini	℥x
Tincturæ Nucis Vomicæ	℥½	Aquæ Carui	q.s. ad ℥j
Tincturæ Cardamomi Co.	℥v		

To be given three times a day.

The quantities must, of course, be made larger for older children, but the arsenic solution should not exceed a drop for the dose. A small dose of opium before meals is also very effective.

The above is the medicinal part of the treatment of diarrhœa; but this is only a part. The looseness is due to a catarrh; therefore with a child so affected every precaution must be taken that the mischief be not maintained or renewed by a series of fresh chills. The washing bath must be stopped for a few days, and only sponging of the face and hands, and of the buttocks after a stool, should be allowed. The feet and legs must be made and kept warm, and the abdomen, as the most vulnerable part, should be covered with a substantial flannel binder. In cold weather the child should be kept indoors, but his living rooms must be carefully ventilated, and no milk or food of any kind when not in actual use should be allowed to remain in them. Moreover, dirty napkins should be removed from the nursery at once.

For food, an infant may take cow's milk (boiled), lime-water, and barley-water in equal proportions; but it must be remembered that the barley-water must be fresh, and that in warm weather it is not a safe addition to the food when more than six hours old. Mellin's food may be added to each alternate meal for the sake of variety, and the child, if twelve months old, may take once a day a cup of veal broth with a rusk. If the looseness continues after two or three days of the treatment, it will be advisable to stop the milk and give instead quite fresh whey and cream, broth, Mellin's food and barley-water or albumen-water, until the stools have again become natural.

In the case of older children, starchy puddings, jam, and fruit must be strictly forbidden, and the diet limited to rusk and milk, broth, sole or plaice boiled or broiled, dry toast and butter, etc. In them, too, the bath is to be forbidden for the time, and great attention must be paid to the warmth of the feet and legs.

Septic Diarrhœa, often called summer diarrhœa, is distinguished by two prominent symptoms: the temperature is raised, and the skin, especially that of the abdomen, is markedly inelastic. The latter is a sign of the utmost gravity, for, however mild the other symptoms may appear, unless the elasticity of the skin can be restored the child will surely die.

A high temperature is best reduced by enemas of cooled water; but in making use of the remedy we must bear in mind the tendency in this complaint to sudden collapse, and remember that a too rapid reduction of the bodily heat may be attended by serious symptoms of heart failure. It is wise to begin with a temperature of 80° to 85°, and 4 oz. of boiled water cooled to this heat should be passed slowly into the bowel. Any sign of depression must be noted, and it is judicious to give a dose of brandy both before and after the operation, and apply heat to the child's feet when he is returned to his cot.

The injection is to be repeated at intervals as the temperature rises again, gradually increasing the quantity of fluid, and using water as cool as the child will bear without showing symptoms of shock. We should try to keep the rectal temperature below 102°.

To restore the lost elasticity of the skin, the patient is wrapped as high as the armpits in a towel wrung out of cold water which has been made more stimulating by the addition of $\frac{1}{6}$ part of brandy or eau-de-Cologne, and is then closely covered from the neck downwards with dry blankets well tucked in. The child may remain thus swathed for many hours, or even several days, with great benefit. Every few hours he should be taken out of the wraps, rubbed dry, and repacked as before. The diuretic action of 10 drops of nitrous ether given in a little water every two hours is a useful addition to this treatment, for a copious flow of urine is often followed by immediate return of the healthy resilience of the skin. The wet pack is well borne as a rule, and usually helps to reduce the temperature of the body ; but if it have an opposite effect, or lead to cardiac depression, its use must be at once abandoned. In that case, and indeed in all cases where the skin is definitely inelastic, especially if there be noted any tendency to general collapse, the hypodermic injection of a warm saline solution is of the utmost value. The solution is composed of 2 drachms of chloride of sodium and 4 gr. of chloride of calcium to the pint of distilled water. Of this half a pint is used on each occasion. The mode of proceeding is as follows : The fluid, heated to a temperature of 128° to 130°, is poured into a thermo-flask. A board perforated with a hole close to the edge is placed across the cot, and upon this the flask is inverted with its neck passing through the opening. The mouth of the bottle is closed by a cork, to which are fixed two Jacques rubber catheter tubes (No. 5), each about a foot long and ending in a fine trocar. The pointed ends are passed quickly through the loose skin of the abdomen or thigh, a few inches apart. At first the fluid is allowed to flow quickly into the subcutaneous tissue, but as it accumulates and forms a swelling under the skin, the force of the current is reduced by means of a clip fixed upon each tube. The time required for emptying the flask and passing the whole quantity of saline under the skin is from an hour and a half to two hours, and some hours usually pass before this is completely absorbed into the system. In bad cases the process is repeated twice a day—in the abdomen and thigh alternately. The immediate effect is to restore—at any rate temporarily—elasticity to the skin, and lessen the tendency to collapse. It is unusual to find any sign of inflammation at the seat of injection : indeed, the procedure seems to be the cause of little inconvenience to the patient, and there is no doubt that it has been the means of saving many lives.

If vomiting be obstinate, the stomach should be washed out and nothing but cold sterilized water allowed to be taken. As the thirst is extreme, water may be given frequently ; indeed, the child, if he can suck, may be allowed to take it at will from a feeding-bottle. After washing out the stomach, a poultice containing $\frac{1}{6}$ part of mustard should be applied to the epigastrium ; and a few doses of calomel ($\frac{1}{6}$ gr. put upon the tongue every half-hour) help greatly to allay the irritability of the stomach.

As long as the vomiting continues, water should be the only fluid allowed to be taken, but when this is found to be retained, we may attempt cautiously to feed the patient with white-wine whey, plain whey, or albumen-water. These must be freshly made and be given cold in gradually increasing quantities, but at first we should allow only 1 teaspoonful every quarter of an hour. Milk is to be strictly forbidden.

To control the purging, astringents do more harm than good while the temperature continues high, and an antiseptic in some form is indispensable. The best of these, indeed the only one which I have found of any appreciable value, is calomel. It should be given in doses of $\frac{1}{6}$ gr. every two or three hours in conjunction with either compound ipecacuanha powder $\frac{1}{6}$ gr., or naphthalene $\frac{1}{2}$ gr., or resorcin 2 gr., or chloral hydrate 1 gr., or β-naphthol $\frac{1}{4}$ gr.

When the temperature has fallen, if the diarrhœa still continues, the astringent class of remedies may be resorted to. Of these perhaps the most useful is the salicylate of bismuth :—

℞ Bismuthi Carbonatis	gr. v	Sodii Salicylatis	gr. j
Glycerini	℥x	Aquæ	q.s. ad ℥j

Every three or four hours.

But any of the remedies recommended for catarrhal diarrhœa may be made use of.

One of the special dangers connected with septic diarrhœa is the tendency to general collapse, and the first sign of prostration must be met with energetic stimulation. The mustard and linseed poultice before recommended should be applied over the heart, or the infant may be put into a mustard bath and held there until the skin is well reddened; white-wine whey in frequent doses of 1 teaspoonful should be given if it can be retained, and $\frac{3}{4}$ of a drop of liquor strychninæ, with 5 drops of ether, should be injected under the skin. This latter remedy, with or without the ether, should be repeated every hour while the prostration continues. The hypodermic injection of the warm saline already referred to should never be omitted in these cases.

It sometimes happens that an attack of septic diarrhœa leaves behind it a general œdema without albuminuria. This is first noticed at a late stage of the complaint when the stools have nearly or even quite regained their normal appearance. In the many cases which have come under my notice, the cardiac physical signs have been normal, it has been exceptional to find any sign in the urine of infection by the *Bacillus coli* or other organism, and there has been no special anæmia; often, indeed the lips of the infant have been quite red. The œdema has been general, affecting the face as well as the limbs. Some of the cases I have treated successfully with adrenalin chloride—5 drops of the 1–1000 solution three times a day. In others the œdema has passed off quickly with :—

℞	Caffeinæ Citratis	gr. $\frac{1}{4}$–j	Glycerini	℥x
	Tincturæ Digitalis	℥j–iij	Aquam	ad ℥iss
	Spiritus Ætheris Nitrosi	℥xx		

M. Ft. haustus. To be taken three times a day.

In children after the age of infancy the hypodermic injection of morphia has an almost immediate effect in checking the vomiting and purging. The earlier in the complaint the remedy is used the better; it is of no further advantage after prostration has set in. For a child of four years of age $\frac{1}{60}$ gr. may be used, combined with 5 drops of ether, and the injection may be repeated in three hours, if it is considered that a sufficient effect has not been produced.

Chronic Diarrhœa is the result of continually recurring catarrh of the bowel. To put a stop to it we have to take every possible precaution to avoid a fresh chill. The child's feet and legs, which are always bitterly cold, must be wrapped thickly in cotton-wool, and the washing bath—at any rate for the first fortnight—must be prohibited. When it is resumed the child must be sponged for one minute in hot (100°) soap-suds.

In the diet, milk must be forbidden, and the food should consist, for an infant, of fresh whey and barley-water; whey and cream; veal broth and barley-water; and yolk of egg beaten up with veal broth or barley-water. Mellin's food or extract of malt may be added to any of these foods for the sake of variety.

Older children should take no milk, and very little starch. Pounded mutton or chicken, minced sole or plaice, egg, fat of bacon, toast or malted bread may be allowed; butter may be given freely; and well-boiled cauliflower or vegetable marrow, or, in winter, large Spanish onions stewed for five hours *with frequent changes of the water*, are unobjectionable. In bad cases, raw mutton pounded and strained through a sieve should be given in quantities as large as the child can be induced to take. This is especially useful when the patient is passing large unformed putty-like stools, consisting chiefly of fat and starch.

For medicine, nitrate of silver combined with opium should be our mainstay :—

℞	Argenti Nitratis Cryst.	gr. $\frac{1}{6}$	Glycerini	℥x
	Tincturæ Opii	℥j	Aquæ	q.s. ad ℥j
	Acidi Nitrici Diluti	℥ss		

The dose of the nitrate may be increased for older children to $\frac{1}{5}$ gr. This remedy is of inestimable value in all cases of prolonged gastro-intestinal derangement occurring, not only in children, but at every period of life. In the child it is often the only drug which appears to have any power of putting an end to the deranged state of the bowels. No fears need be entertained of pigmentation of the skin by the nitrate unless the remedy be continued for many months at a stretch. It may be given directly the acute stage has come to an end, and can be continued for six months together, if necessary, without

interruption, and then stopped for a time ; and if it be returned to later, may be continued for another four months without risk. After ten months a further continuance of the treatment may possibly lead to a slight pigmentation of the skin of the face. These cases of chronic diarrhœa are so liable to relapse that a frequent return to medication by the drug is often found to be necessary. It must therefore be remembered that ten months' use of the remedy, whether the drug be given intermittently or in one continuous course, is the limit of certain safety as regards discoloration of the skin. In prescribing the nitrate it is advisable to warn the parents of the child that the medicine is one which cannot safely be used except under medical advice and supervision. This caution should never be neglected, for so obvious is the improvement set up by the use of the nitrate, that parents who have been impressed by the favourable results of the treatment will often in cases of relapse return to the remedy on their own initiative and without the knowledge of their medical attendant. This, it is needless to say, we must do our best to prevent. I have seen several cases in which permanent pigmentation of the skin has been induced by the incautious employment of the drug.

We may use as alternatives the salicylate of bismuth mixture recommended for septic diarrhœa, or any of the following :—

℞ Liq. Hydrargyri Perchloridi	℥x	Aquæ Chloroformi		
Tincturæ Opii	℥j	Aquæ Destillatæ		āā ʒss

Three times a day.

Or,

℞ Extracti Hæmatoxyli	gr. j	Glycerini	℥x
Tincturæ Krameriæ	℥iij	Aquæ	q.s. ad ʒj
Tincturæ Opii	℥j		

Three times a day.

Or,

℞ Salol	gr. ij	Pulv. Cretæ Arom. c. Opio	gr. ss
Bismuthi Subnitratis	gr. v		

Ft. pulv. To be given made into a paste with 2 or 3 min. of glycerin three times a day.

Any of the astringent mixtures recommended for simple diarrhœa may be used, but lead salts should be avoided as inadmissible for infants.

If the stools are large and pasty, a dose of powdered rhubarb 3 gr., aromatic chalk powder 1 gr., should be given first, and after its action the nitrate of silver medicine ; but indeed the latter is useful at any time after the acute stage has passed away, whatever be the character of the stools ; taking care, however, that if an acute relapse occur with diarrhœa, the nitrate be discontinued until this has subsided. Much mucus in the stools is an indication for the perchloride of mercury mixture already recommended, or for the castor oil and opium mixture.

When the diarrhœa has been arrested, a tonic is often required to give tone to the bowel and brace up the mucous membrane. The best of these is perhaps pernitrate of iron, 2 drops of the solution being given with $\frac{1}{6}$ drop of the tincture of nux vomica in a teaspoonful of infusion of calumba, three times a day after food. It should be sweetened with glycerin.

In cases of tuberculous ulceration of the bowel with diarrhœa, the same measures will usually be sufficient to control the purging by curing the intestinal catarrh. The nitrate of silver is especially useful in these cases. It must be remembered, however, that the improvement in the stools does not imply an arrest in the ulcerative process.

Eustace Smith.
(Revised by R. Hutchison.)

DIARRHŒA, TROPICAL.—Chronic diarrhœa, or recurrent attacks of diarrhœa, are very closely allied to dysentery. They frequently follow it, and are often associated with similar lesions. If mucus be present in such stools, with or without blood, the disease should be regarded and treated as chronic dysentery. If amœbæ are found, the diagnosis is certain. In some cases flagellates such as *Lamblia intestinale* or their cysts are found. In these cases intestinal antiseptics, such as β-naphthol 5 to 10 gr., as tabloids, given every four or six hours, are often markedly beneficial. Bismuth salicylate, 15 gr. three times a day, is always worth a trial. In other cases a close inquiry into the habits and diet

may reveal irregularities as the cause ; the commonest errors are abuse of alcohol and an excessive meat diet.

In many such cases an increase in the amount of fresh vegetable food, not excluding green vegetables, making free use of native roots, such as yams, arrowroot, sweet potatoes, etc., and limiting the amount of meat, will result in speedy improvement. Moderate but regular exercise is of great value. A preliminary purgative should be given before commencing the treatment.

In other cases the diarrhœa is due to incomplete evacuation of the intestinal contents, and subsequent irritation from decomposition of the portion of excreta retained. In such cases the regular administration of rectified petroleum, or chrismol in nightly doses of 1 drachm to ½ oz., is often beneficial.

Many cases of tropical diarrhœa are in reality due to *Entamœba histolytica*, and to these the term 'amœbic diarrhœa' should be applied, although the organism itself may not be sufficiently obvious in the stools ; therefore in any suspected case injections of emetine in 1-gr. doses are always worthy of a trial.

The abdomen and loins must be kept well covered by a broad flannel belt or bandage. (*See also* DIARRHŒA, HILL.) *C. W. Daniels.*

DIATHERMY.—(*See* ELECTROTHERAPEUTICS ; THERMOTHERAPY.)

DILATATION OF STOMACH.—(*See* STOMACH, DILATATION OF.)

DIPHTHERIA.—The two cardinal points in the treatment of this disease are : (1) *The early use of antitoxic serum ; and* (2) *Rest in bed.*

1. The imperative need of giving antitoxic serum (or antitoxin, as it is briefly called) at the earliest opportunity, in all forms of diphtheria, cannot be too earnestly impressed upon the practitioner, even though the nature of the disease may be doubtful when the patient is first seen. Diphtheria is usually subtle in its onset, and frequently swift in its evolution. In treatment hours are of value, and the earliest hours are the most precious. It is perilous to wait till diphtheria bacilli have been demonstrated (unless they are demonstrated on the spot in a smear preparation), till the local exudation has become definitely membranous, or till symptoms of toxæmia appear. In the large majority of cases, antitoxin, if given on the first day, will cut short the disease by preventing the spread of the membrane, and by neutralizing the action of any toxin that may, even so early, have been absorbed. Paralysis and cardiac troubles are rare and slight in cases treated with antitoxin on the first day.

When there is a reasonable suspicion of diphtheria of whatsoever form (i.e., faucial, laryngeal, etc.), 2000 units of antitoxin should be injected. In mild cases seen on the first day, this dose will usually suffice ; but if the case is a severe one, as it often is after two or three days' illness, the dose must be increased to 8000, 10,000, or even 20,000 units. As that portion of the serum which contains the antitoxin is not absorbed quickly, it is advisable to give the requisite amount in a single dose. If membrane still persists in large amount on the third day after the injection, half the first dose may be then injected. The writer is of opinion that 16,000 to 20,000 units, altogether, is about the limit beyond which it is unnecessary to go ; but no harm can be done to the patient by giving larger doses if they are thought to be desirable.

The most efficacious mode of administering antitoxic serum is by intravenous injection. There are, however, several practical objections to this, and the most convenient method is by hypodermic injection.* The best site is the lateral region of the abdomen. If given anywhere in the back, the patient may be prevented for three or four days, by

* Experimental evidence shows that intravenous injection is more efficacious than subcutaneous. The whole of the antibody (antitoxin) in the serum is at once introduced into the circulation, whereas in subcutaneous injection it takes from two to three days for the antibody to be present in the circulation in any efficacious amount ; and even then the amount present is very much less than the amount injected. The practical difficulty is that it is by no means always an easy matter, in a severe toxic case of diphtheria, to hit off a vein in which to inject the serum. As for the administration by the mouth or rectum, experimental evidence is quite against its efficacy. For the best method of performing intravenous injection, see the article on SPECIFIC THERAPY.

the tenderness and stiffness that sometimes follow, from lying on the back with comfort. The swelling caused by the injection of the serum usually disappears in fifteen to thirty minutes, according to the amount. Care should be taken that the serum enters the subcutaneous tissue, and not the skin, as injection into this structure is very painful. Every aseptic precaution should be used; the skin should be washed with soap and water, and painted with iodine, and the syringe boiled just before the injection. The most convenient forms of syringe are Roux's and those made (except as regards the needle) entirely of glass. The needle should be connected with the nozzle by three or four inches of india-rubber tubing.

Before injecting the serum, any air that is present should be expelled from the needle, tubing, and syringe. The puncture made by the needle should be sealed with a little cotton-wool dipped in collodion. When filling the syringe, be careful that the serum is exposed to the air for the shortest possible time. Once having uncorked a bottle or tube of serum, use all the contents immediately; do not recork the bottle to keep for future use. But so long as a bottle has not been uncorked, and has been preserved in a dark, cool place, the serum retains its efficacy for several months. J. F. Anderson has found by experiment that antitoxic serum kept at ordinary room temperature loses 20 per cent of its potentiality in a year. If kept at 5° C. it loses 5 per cent a year. Dried serum kept in the dark at 5° C. remains unimpaired for at least five and a half years.

Antitoxin will sometimes give rise to a rash (urticaria or a variety of hyperæmic erythema) which itches intolerably; the application of spirit lotion, or lead and opium lotion, or menthol ointment (1 drachm of menthol to an ounce of paraffinum molle) will allay this irritation; calcium lactate in 5-gr. to 15-gr. doses should also be given every four hours. For the pains in the joints and fasciæ that sometimes occur, lead and opium lotion, or glycerin and belladonna, externally, with a suitable dose of laudanum internally, is the best treatment. Sodium salicylate is not usually of much avail. An abscess at the seat of injection will occasionally occur.*

2. Next to antitoxin, *rest* is the most important factor in the treatment of diphtheria. The pathological change most to be feared is fatty degeneration of the cardiac muscle. It is highly probable that this occurs in all cases where toxæmic symptoms, however slight, are present. It certainly occurs in all severe cases; and it sets in early in the disease. Therefore the patient should be confined to bed at once, and kept there for ten days or a fortnight after the disappearance of the exudation in mild, or of toxæmia and cardiac symptoms in severe, cases; indeed, he must be restricted to the recumbent position, and the effect of sitting up in bed should be observed for a few days before he is allowed out of bed. The condition of the circulation should be carefully and frequently observed. When the patient is first allowed out of bed, it should only be to sit in an easy chair for two or three hours; and the effect of even this slight exertion should be carefully watched. Any sudden or prolonged exertion is to be prohibited absolutely for several weeks after an attack of diphtheria, the length of time varying according to the nature of the attack. If the exudation has persisted for several days; if there has been albuminuria for more than one or two days; if there has been any cardiac irregularity, or any paralysis (nasal voice, squint, etc.), the necessity of this prohibition is emphasized. In severe cases, not only physical but mental excitement is to be avoided.

So long as any exudation is present, local treatment should be carried out with a view to removing it; but if the patient vehemently resists, as is often the case with children, it should be omitted, because the struggles of the patient are harmful to him. When the exudation is extensive, syringing the nose and fauces should be practised; but with limited exudation, gargling or swabbing will be sufficient. The following liquids are useful: warm

---

* The rashes, etc., due to serum usually appear a week to a fortnight or more after the injection. But occasionally when a patient has already had horse-serum several weeks or months before, the rash may come out within a few hours or a day or two; and there may also occur severe symptoms—high temperature, rigor, collapse, cyanosis—in addition (anaphylaxis, supersensitization). Hence some caution should be exercised in horse-serum for relapses or second attacks; it should be given only when they threaten to be serious. There is also evidence to show that these symptoms in their most severe form are prone to occur, even when the serum is given for the first time, in persons who are the subjects of asthma, or who exhibit symptoms resembling 'hay fever' immediately after having been in the close vicinity of horses. More than one fatal case has occurred.

water, normal salt solution, saturated solution of boracic acid, chinosol 1–600 to 1–1000, and the following alkaline solution :—

℞	Sodii Biboratis	ʒj	Sodii Chloridi		ʒss
	Sodii Bicarbonatis	ʒj	Tincturæ Lavandulæ Compositæ		ʒj
	Potassii Chloratis	ʒss	Aquæ	q.s. ad	Oj

Solutions that are so strongly bactericidal as to be able to destroy the bacilli *in situ* do more harm than good, being as inimical to the mucous membrane as to the micro-organisms. By setting up inflammation they actually further the spread of the diphtheritic exudation.

Syringing should be performed with a ball syringe, or, better still, with a douche-can and tube. When using these appliances, care should be taken that the nozzle is not so long as to reach the soft palate, lest injury be inflicted on this structure.

In nasal diphtheria, the nasal fossa should be syringed out with the alkaline solution mentioned above. Hæmorrhage is very rarely so profuse as to require treatment. If it occur, the nose should be syringed with iced water, having alum or tannic acid dissolved in it. In very severe cases of hæmorrhage the nares must be plugged.

Cardiac Failure.—In diphtheria this occurs in two forms : (1) There is the comparatively slowly progressing failure, which may be observed to a greater or less degree in all cases of toxæmia during the first fortnight of the disease. The ordinary cardiac stimulants are quite useless in this condition. Adrenalin chloride is recommended by Dr. J. D. Rolleston ; but the present writer is bound to say the drug has not come up to his expectations : 5 min. of a 1–1000 solution in a drachm of camphor water should be given every four hours, the dose being gradually increased to twice these amounts every two hours. If there is vomiting, and rectal feeding has to be resorted to, 3 drachms of the solution (15 min. of adrenalin) may be given in each nutrient enema every four hours. (2) There is the cardiac paralysis of convalescence. This frequently takes the form of a syncopal attack. Here strychnine, brandy, and similar stimulants are of great value. The patient should be placed on his back with his head lowered, and hot-water bottles should be applied to the feet. But if the warnings already given as to the necessity of strict rest during the first few weeks of convalescence are heeded, serious attacks of syncope will not often be met with.

Vomiting is another symptom of diphtheria that frequently calls for treatment. This, too, may be early or late, and the former is most intractable. The following treatment, introduced by Dr. G. C. Garratt, should be tried : All nourishment by the mouth must be omitted, and nutrient enemata given every four hours, 20 to 30 min. of tincture of belladonna being added to each enema, with 20 gr. of potassium bromide once every twelve hours. About an hour after each dose of bromide, introduce slowly into the child's stomach 10 or 12 oz. of water at 115° F., to which a little sodium bicarbonate has been added. In order that this may be done, the child must be wrapped in a large towel ; the body and legs are held by a nurse, and the head is laid upon a mackintosh spread over the operator's knees. A good-sized silk-gum œsophageal tube, previously bent to a suitable curve, must be passed through the mouth into the stomach. If the water is rejected, pour in some more till it is retained. Take out the tube quickly, and after waiting a few minutes, put the child to bed. Strychnine and alcohol must not be given. Vomiting occurring at a later stage is best treated by giving nourishment by enemata.

Paralysis.—If paralysis, however slight, sets in after the patient has been allowed to get up, he should be ordered back to bed at once. The length of time it will be necessary to keep him there depends upon the course and extent of the paralysis.

If there is regurgitation of fluids through the nose, or coughing and spluttering when the patient drinks, he should be allowed only thickened liquid food, such as cornflour. Young children should be fed by means of a tube passed through the nose and œsophagus ; if there is vomiting, nutriment must be given by means of enemata till it ceases.

When the respiratory muscles are affected, the foot of the bed should be considerably raised, to prevent saliva trickling into the air-passages, and to facilitate the escape of mucus from the lungs ; 20 to 30 min. of tincture of belladonna should be given by the mouth or rectum every four hours. The patient may also be made to inhale oxygen at intervals. Ciliary paralysis will prevent an adult from reading ; the provision of suitable

plus glasses will remedy this inconvenience. Strychnine is a very useful drug in paralytic cases. When the patient is beginning to recover, the wasted muscles should be massaged.

Laryngeal Diphtheria.—Directly there are signs of affection of the larynx, the patient should be placed in a warm moist atmosphere. This may be accomplished by means of a bronchitis kettle. If the patient is in a ward or a large room, it will be necessary to put him under a tent into which the steam escapes. Another dose of antitoxin should be given. Under this treatment most cases will get well without the surgeon's aid. But if the laryngeal symptoms are urgent, surgical relief must be afforded. The writer usually waits till the dyspnœa prevents the patient getting any rest, or till there is considerable recession. In private practice the relief afforded must be by tracheotomy, but in hospital practice it should be by intubation. The latter operation requires the constant attendance of a medical man within three or four minutes' call; hence it is unsuitable for private practice.

In hospital practice the only contra-indication to intubation is a moribund state of the patient from suffocation; then tracheotomy is essential.

Intubation.—The instruments necessary for intubation (*Fig.* 15) are: (1) The intubation tube; (2) The obturator or pilot, which fits into the lumen of the tube, and is rigidly fixed by a slot and bolt to (3) The introducer; to the introducer is attached a sort of arm, which can be moved by the thumb in such a way as to release the tube from the pilot; (4) A gag. A long loop of silk or thread is attached to a hole in the head of the tube.

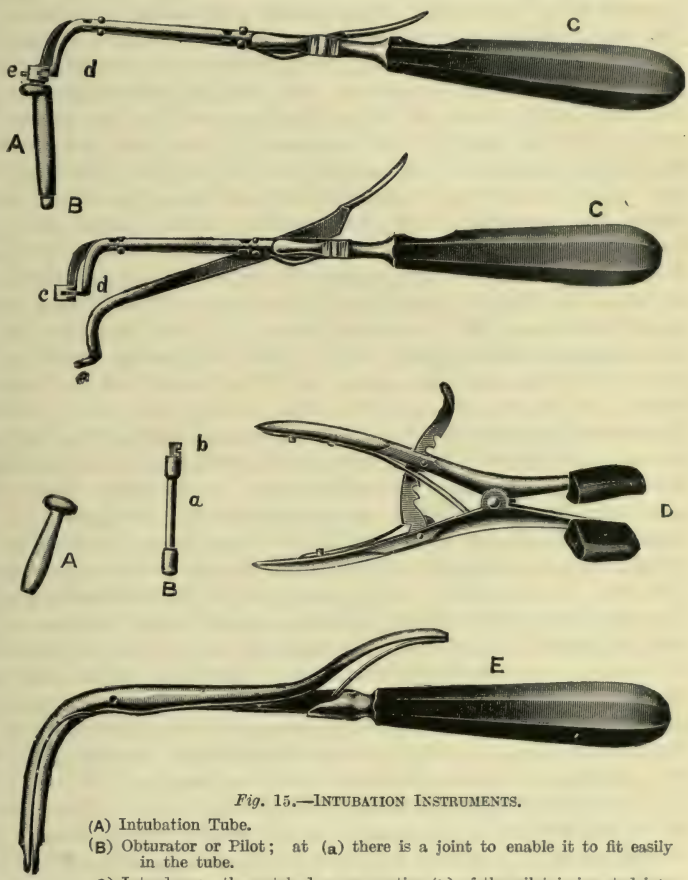


Fig. 15.—Intubation Instruments.

(A) Intubation Tube.

(B) Obturator or Pilot; at (a) there is a joint to enable it to fit easily in the tube.

(C) Introducer; the notched upper portion (b) of the pilot is inserted into a socket (c) at the end of the introducer, and is kept firmly in place by the bolt (d); (e) is the movable arm of the introducer for pushing the tube off the pilot. In the illustration it is much more depressed than it would be at the moment of use. The illustrations show the instruments separately, and put together for use. The tube (A), where shown separately, is seen from the front.

(D) Gag.

(E) Extractor; the blades are slightly separated.

The instruments figured are those modified by Bayeux from O'Dwyer's pattern, and made by Collin, of Paris. A set of all the requisite instruments is supplied in a box; besides the instruments mentioned, there is an extractor for the removal of the tube. The size of the tube to be used varies with the age of the patient. An anæsthetic is quite unnecessary. The patient should be laid flat on his back. In most cases of diphtheria it is undesirable to place the patient in the upright position on account of the liability to syncope. It is, moreover, easier to steady the head in the recumbent than in the upright posture. The operator requires the freest control over the instrument at the moment when the tube is being introduced into the larynx, and he will obtain it by placing the

recumbent patient well below him. The writer lays the patient across the end of the bed, so that the patient's right side is nearest to its foot. The operator stands at the foot of the bed. One nurse holds the patient's head, another secures the arms and legs. An intelligent child will often not require to be held, so far as the arms and legs are concerned. The operator should satisfy himself that the tube is not too tightly fixed on the pilot, and that it can be easily pushed off by the arm on the introducer. The pilot should be smeared with a little vaseline or olive oil. The tube should be placed upon the pilot so that the projecting portion of the head is directed backwards as regards the patient. The gag is inserted into the left side of the mouth, and is kept in place by the nurse who has hold of the head, which must be kept straight, with the face looking directly upwards. If there is much mucus in the mouth and pharynx, it should be removed with a swab. The operator, holding the introducer, with the pilot and tube (with thread) fitted into place, in his right hand, introduces his left forefinger behind the tongue to the epiglottis, the condition of which is noted.* Not infrequently it is bent backwards, and must be straightened before the tube can be introduced into the larynx. The finger is then pushed over, or by, the epiglottis, and the arytenoid cartilages and the orifice of the larynx are felt. Here, again, the operator notes the condition of the parts, and acts accordingly. Extreme swelling of the glottis, for instance, would induce him to put a smaller tube on the pilot. The tip of the finger is held against the arytenoids just over and at the back of the laryngeal orifice. The end of the pilot is then passed carefully along the anterior surface of the curved forefinger till it reaches its tip. By this movement the end of the instrument is brought over the laryngeal orifice. Before inserting the tube in the larynx the operator must be certain that the whole tube—not only its lower end—is in the middle line, for usually this is not the case while it is being passed along the finger. Having rectified the position of the tube, the operator slips it past the tip of his finger into the larynx. In performing this action I find it nearly always necessary to flex slightly the right wrist and at the same time to raise the right elbow. I say 'slips into', for undue pressure must be avoided. When intubation is performed with the patient in the upright position, the tube will often enter by the weight of the instrument, without any pushing. If laryngeal spasm prevents the entry of the tube, it may be overcome by very gentle but continuous pressure ; or advantage may be taken of an inspiration to slip the tube past the cords.

The tube is then partly released from the pilot by means of the arm of the introducer, and the pilot is withdrawn. During this action, the tip of the left forefinger must on no account be removed from the head of the tube, which will be resting on the arytenoid cartilages ; otherwise the tube is almost certain to be pulled out of the larynx. In some cases it will be found, while withdrawing the pilot, that the tube has not completely entered the larynx ; but the slight pressure exercised by the finger on the head of the tube during the withdrawal of the pilot sends the tube home.

When the introducer and pilot have been removed, the operator, by means of the tip of his left forefinger, ascertains that the tube is safely in the larynx. The loop of thread should then be removed by cutting and pulling it gently through the hole in the tube, taking care that the knot in the thread is not pulled against the small hole in the tube. While the thread is being removed, the finger should be kept on the head of the tube, or the latter will certainly be pulled out of the larynx. The gag is taken out, and the patient, if relieved, is put back to bed.

Some operators leave the thread attached to the tube, in which case it must be fastened round the patient's left ear or, with a piece of plaster, to his cheek. The writer prefers to dispense with the thread ; it irritates the epiglottis, tongue, and angle of the mouth ; the child will pull it and remove the tube ; hence it is necessary to restrain his hands by cardboard splints on the arms, or by some other method ; and this irritation and restraint are most irksome. The only reason for retaining the thread is that the nurse may be able to pull out the tube at once, should it become suddenly blocked. But as a matter of fact this seldom happens ; moreover, the nurse can be taught to get the tube out by the method of expression, to be described below.

---

* It is convenient to twist the silk or thread loop once round the right index finger, keeping it moderately tight. It will help to secure a loosely fitting tube in place on the pilot. When the tube is in the larynx it is easy to disengage the thread from the finger.

Since this account of intubation was written certain improvements have been made in the instruments. It happens occasionally that during the withdrawal of the obturator, or pilot, the bolt slips, and the pilot is left in the tube. To obviate this accident, the pilot, in instruments of the pattern described above, is now made to fix by a long curved rod to the introducer at a point near the handle. But a much more important improvement is that which has been made in the shape and size of the pilot. Not infrequently, even in the most practised hands, there is considerable difficulty in disengaging the pilot from the tube. Again, frequent use and cleaning weaken the joint which is in the middle of the pilot; and instances have occurred in which the joint has broken during the operation, and its lower portion has remained in the tube or been swallowed by the patient. It cannot slip through the lower end of the tube into the trachea, because the bulb at its end is larger than the lower orifice of the tube. In Moreau's instrument the pilot is jointless and very short; it is fixed to the introducer by a bolt, as in the instrument described above. When the pilot is in position, the tube is prevented from slipping off it by means of a catch which fits under the projecting posterior part of the top of the tube. This catch is at the end of a long movable arm, which, bent and pivoted at the angle of the introducer (similar to that shown in *Fig.* 15), is continued to near the handle of the latter, where it is manipulated by the operator. This arm replaces in function that marked (*e*) in *Fig.* 15, and by it the pilot is released with the greatest ease. The pilot and introducer are hollow; when they are put together there is a continuous open passage from the tube, through the pilot and introducer, right up to the end of the handle of the latter. At this spot is placed a whistle. Directly the tube enters the orifice of the larynx, every expiration made by the patient blows the whistle, and the operator is made aware that the tube is entering the right orifice.

To meet the difficulties of the hinged pilot which have been mentioned, Avrignet's instrument has also been invented. It is an extremely simple one. The pilot consists of a steel spring which is fastened permanently to the introducer, and terminates below in a bulb. But the spring is too delicate to stand much wear, and should it break while in the tube when the latter is in the larynx, the portion broken off would slip into the trachea; for in the specimens of the instrument seen by the writer, the lower orifice of the tube is not narrow enough to prevent this accident.

The writer is of the opinion that Moreau's ingenious instrument is the best at present in the market. It can be obtained from Collin, of Paris. The method of introducing the tube is the same as that described for the instrument shown in *Fig.* 15.

Extubation.—Removal of the tube may be accomplished in two ways. The first is by expression ('*énucléation*'). This is most easily performed with the patient in the sitting position—an objection to this method in toxic diphtheria—but it can also be done while the patient is lying on his side. The patient's head is thrown back as far as it will go. This position throws the larynx and trachea prominently forward. The patient's mouth should be open. The operator places the right thumb on the trachea immediately below the larynx, and his left hand on the occiput. Then with simultaneous and sudden actions he presses his thumb firmly backwards towards the spine and flexes the patient's head. The lower portion of the tube has the shape of an inverted, truncated cone, and under the pressure of the thumb the tube slips up into the pharynx, against the posterior wall of which it impinges; by the forward movement of the pharyngeal wall in the flexion of the head the tube is directed into the mouth, and even out of it if it is open. Removal may also be effected by the extractor, the two small, separating blades of which must be inserted into the upper part of the tube. The patient must be gagged, and the method of putting the blades into the tube is very much the same as that employed in introducing the tube into the larynx.

In cases where there is laryngeal spasm immediately after the first removal of the tube, so that immediate re-intubation is required, a small dose of opium, or bromide of potassium, or chloral hydrate, should be given a few hours before it is proposed to remove the tube again.

The patient who is wearing an intubation tube must be fed by means of an œsophageal catheter passed through the nose. But he may have a sip of water occasionally, for the slight cough thereby excited helps to keep the tube clear. After three or four days the tube should be removed. It may have to be returned. The writer is of the opinion that

if the patient cannot do without the tube after three periods of retention of three or four days each, recourse should be had to tracheotomy. If the tube is frequently expelled by coughing, tracheotomy should be performed.

Intubation should never be undertaken without having the tracheotomy instruments ready to hand, because, very occasionally, diphtheritic membrane may be pushed down during intubation so as to block completely the lumen of the trachea, in which case the patient rapidly becomes worse, and tracheotomy must be performed. This operation will be necessary also in cases where repeated intubation has failed to relieve. (*See* LARYNGEAL OBSTRUCTION.)

Vulvar and conjunctival diphtheria should be treated locally by frequent irrigation with a saturated solution of boracic acid, and warm boracic fomentations.

No patient convalescent from diphtheria should be considered to be free from infection till at least three weeks have elapsed since the local exudation has finally disappeared and the parts which have been affected have regained their normal appearance, or until two consecutive cultures have yielded negative results as regards diphtheria bacilli.

Quarantine Period.—One week; during this period all persons who have come in contact with the patient (contacts) should be examined daily for clinical evidence of diphtheria.

In institutions for children, when prompt removal of two or three successive cases has failed to arrest the outbreak, the remaining children should be examined to ascertain their natural immunity by means of the Schick reaction. This test consists of the *intra*-cutaneous injection of 0·2 c.c. of a solution of diphtheria toxin containing one-tenth of a minimal lethal dose in 1 c.c. There is, therefore, one-fiftieth of a minimal lethal dose in the 0·2 c.c. In from twenty-four to forty-eight hours a well-defined round or oval area of redness and infiltration is observed, which lasts for several days. Such children as react positively should be injected either with 500 to 600 units of antitoxic serum or with a toxin-antitoxin mixture.* Park and Zingher recommend 1 c.c. of such a mixture in which there are 85 to 90 per cent of the L. + dose of toxin to each unit of antitoxin. But the occasions for prophylactic measures of this description are, in this country, few and far between.

In the case of chronic carriers of diphtheria bacilli, vaccination with 5 to 10 million autogenous bacilli at intervals of five to seven days should be tried. If the tonsils are hypertrophied or adenoids be present, they should be removed. (*See also* SPECIFIC THERAPY; LARYNGEAL OBSTRUCTION; LARYNGITIS; and FEVERS, ACUTE INFECTIOUS.)

E. W. Goodall.

DIPLEGIA.—(*See* PALSIES, CEREBRAL.)

DIPSOMANIA.—(*See* ALCOHOLISM.)

DISLOCATIONS.

Lower Jaw.—This dislocation is always in a forward direction, and is more commonly bilateral. In recent cases there is usually little difficulty in reduction, the patient often effecting this without assistance.



Fig. 16.—Reduction of Dislocation of Lower Jaw.

REDUCTION.—No anæsthetic is required as a rule. (1) The patient is seated in a chair, and the surgeon stands facing him. The thumbs, well guarded by wrapping in handkerchiefs, are introduced into the mouth and placed far back on the lower molar teeth of each side (*Fig.* 16). The thumbs then press the back part of the jaw downwards, whilst the fingers of the two hands, meeting beneath the chin, press the fore part of the jaw upwards. The condyles are thus levered downwards, and when once disengaged from the eminentia articularis slip into their socket, and the jaw closes with a snap. (2) When the first method fails, wedges of cork are placed between the molar teeth of the

* But prophylactic injections should not be given without strong reasons; for should serum have to be given at any subsequent date the phenomena of supersensitization may be produced (*see* note on p. 227). It is not advisable to give a prophylactic injection to any person who is subject to asthma.

upper and lower jaw, as far back as possible. The surgeon then presses the chin firmly upwards, and thus levers the condyle downwards, reduction taking place as before. If the dislocation be unilateral, the measures detailed are applied to the affected side only.

After-treatment.—A four-tailed bandage is put on as for a fracture of the jaw, the patient being fed on slops. At the end of a week careful passive movements are begun. The dislocation is apt to recur and the joint to become permanently lax; it is therefore advisable to keep the bandage applied for a fortnight longer, removing it thrice daily for the purpose of movements; moreover, the patient should be instructed to avoid opening the mouth widely for three months.

Sternal End of the Clavicle.—Dislocation forwards is by far the most common displacement. Backward and upward dislocations also occur, the order of frequency being as named.

Forward Dislocation.—The sternal end of the bone is more or less completely displaced on to the front of the manubrium sterni.

Reduction is readily effected, and no anæsthetic is required. The surgeon stands behind the patient and, placing his knee between the scapulæ, pulls the two shoulders backwards. Direct pressure on the displaced end of the clavicle may be applied at the same time.

After-treatment.—A large pad is placed in the axilla, and the arm is bandaged to the side, the elbow being kept well forwards. It is very difficult to maintain complete reduction, but the parts should be kept at rest in the manner described for three weeks, in order to allow of union of the lacerated ligaments. It is well to warn the patient of the probability of permanent deformity, but at the same time he may be assured that there will be little or no impairment of the utility of the limb.

Backward and Upward Dislocations are of rare occurrence. They are reduced and treated as in the forward variety, and the above remarks with regard to permanent deformity and utility hold good. In backward dislocations, dyspnœa and dysphagia may be produced by the pressure of the displaced end of the clavicle, and the great vessels may be similarly pressed upon. If the pressure cannot be relieved, owing to the failure of reduction, the head of the bone must be excised.

Acromioclavicular Joints.—The ligaments being torn, the scapula, with the whole upper limb, drops downwards, and leaves the acromial end of the clavicle projecting beneath the skin over the shoulder. Occasionally the clavicle passes beneath the acromion instead of, as in the first case, resting upon its upper surface.

Reduction is readily effected by pulling the shoulder backwards and applying direct pressure in a downward direction to the displaced end of the clavicle.

After-treatment is unsatisfactory. In many cases it is well-nigh impossible to keep the bones in position. The most likely method of effecting this is to place a soft pad over the outer third of the clavicle and to apply a plaster-of-Paris spica bandage to the shoulder, afterwards keeping the patient in bed for three weeks. The danger of injury to the skin from pressure over the displaced acromial end of the clavicle must not be lost sight of. If pain or serious impairment of movement results from persistence of the deformity, the cartilage is removed from the contiguous bony surfaces in the joint, and these are then wired together.

Shoulder.—At least 50 per cent of all dislocations take place at the shoulder-joint. It is, however, unusual to meet with a case of dislocation of the shoulder in a patient under the age of twenty. Violence, such as would in the adult produce this injury, is in early life more likely to give rise to a fracture of the clavicle or a dislocation at the elbow.

The classification is as follows:—(1) Downwards—subglenoid; (2) Forwards—subcoracoid, subclavicular; (3) Backwards—subspinous; (4) Upwards—subacromial, supra-acromial. The head of the humerus leaves the joint through the lower and anterior part of the capsule, and thus comes to lie beneath the glenoid cavity. The head may remain here, giving rise to a *subglenoid* dislocation; more commonly, passing forwards, it reaches a position in front of the glenoid fossa and below the coracoid process, constituting a *subcoracoid* dislocation. Very rarely the head passes still further forwards and inwards, and rests beneath the clavicle, a *subclavicular* dislocation being thus produced. Instead of taking this forward course, the head of the humerus may, after reaching the subglenoid region, pass backwards into the subspinous fossa, and thus give rise to a *subspinous*

dislocation—a condition even more rare than the last described. Such unusual forms as the *subacromial* and *supra-acromial* dislocations need no further mention.

Reduction must be undertaken at once. If there be doubt in diagnosis, a skiagram should be taken; it is useless and dangerous to wait for twenty-four hours in the hope that the swelling may diminish and facilitate examination. During that time the displaced head of the bone may cause irreparable damage to the nerves of the brachial plexus or the axillary vessels. Whenever possible a general anæsthetic should be administered. The necessary manipulations are thus rendered easier, less force is required, and less damage is likely to be caused to the structures around the joint.

For Subcoracoid and Subglenoid Dislocations the following methods are applicable, and should be applied in the order stated. (1) *Traction downwards and outwards.* The patient is placed flat on his back on a couch. The surgeon stands beside him, and, grasping the arm above the elbow, pulls steadily upon it in a downward and outward direction. Then, abducting the limb, he gradually changes the direction of the pull until the arm is at right angles to the body. An assistant standing on the other side of the patient keeps the trunk steady by means of a towel passed around the chest, upon which he pulls in a contrary direction to the traction exercised by the surgeon. This method is effectual in the great majority of cases, especially if an anæsthetic be given. (2) *Kocher's method.* The patient, if not anæsthetized, sits upright in a chair, and a towel, which is passed round his chest and the back of the chair, is held by an assistant, who thus keeps the trunk in a steady position. If anæsthetized, the patient lies on his back,



Fig. 17.—Reduction of Dislocation of Shoulder by Kocher's method. *A.*—The arm is pressed to the side and externally rotated. *B.*—The arm being maintained in an externally rotated position, the elbow is raised in front of the body. *C.*—Reduction completed by internally rotating the arm.

and the assistant steadies the trunk by pressing each shoulder firmly down upon the couch, applying his hands over the front of the acromion and clavicle. The surgeon stands on the affected side of the patient, and flexing the forearm to a right angle (*Fig.* 17), grasps the limb with one hand just above the elbow and with the other the wrist. He then presses the elbow firmly to the side of the chest, and, maintaining it thus, moves the wrist outwards until the forearm points directly outwards from the side of the body. The arm being kept in this externally rotated position, he next elevates the elbow in front of the body until it lies almost on a level with the shoulder, and finally internally rotates the forearm by swinging the wrist across so that the hand comes to rest on the opposite shoulder. (3) *Extension with the heel in the axilla.* The patient lying flat on his back, the surgeon sits on the edge of the couch and places his unbooted heel in the axilla. Seizing the wrist, he pulls upon it in a downward and outward direction, and then bringing it towards the side he levers the head of the humerus outwards, his heel acting as a fulcrum (*Fig.* 18). Care must be taken that the skin of the axilla is not wrinkled into folds, but that it lies flat and smooth under the heel.

For Subspinous and Subclavicular Dislocations.—Extension, aided by rotary movements, is made in the axis of the dislocated humerus until the head of the bone is brought beneath the glenoid fossa. After this, the methods already described will complete the reduction.

After-treatment.—A wool pad is placed in the axilla, the arm is bandaged to the side, and the forearm supported by a sling. After a day or two massage is begun, and passive movements are carried out with gradually increasing freedom. Particular care should be taken to obtain free abduction, but the *combined* movement of abduction and external

rotation is at first to be avoided. At the end of a week the bandage is discarded for a sling, and active movements are encouraged. The patient may return to work at the end of five or six weeks.

Unreduced Dislocations.—If more than six weeks have elapsed since the dislocation, great difficulty will be experienced in reduction; and having regard to the danger of fracture of the humerus, rupture of the axillary vessels, or laceration of the branches of the brachial plexus, it may be looked upon as unjustifiable to attempt the reduction by ordinary methods of a dislocation of more than two months' standing. In cases, therefore, where a trial under an anæsthetic of the methods given above fails to effect reduction, or in cases in which such attempts are thought inadmissible, the question of operation has to be considered. The utility of the limb in its dislocated position, the general condition and occupation of the patient, and the amount of pain and discomfort suffered, will decide for or against operative measures. The best results are given by an excision of the head of the humerus, which relieves the pain and restores the mobility of the limb.



Fig. 18.—Reduction of Dislocation of Shoulder by the 'Heel-in-Axilla' method.

Habitual Dislocations.—Occasionally, after a dislocation has been reduced, it is found to recur as the result of very slight violence. Without any warning, whilst the patient is perhaps merely raising the arm, the shoulder becomes dislocated. In these cases the recurrent displacements tend with time to become more and more frequent, and give rise to such serious disability that operative measures are needed. The best results are given by removing a strip from the front of the capsule of the joint and suturing the gap thus made. Before operation a skiagram should be taken, as in some cases it may be a fracture of the glenoid fossa which is responsible for the condition.

Elbow.—This injury is of frequent occurrence, especially in early life, since the cartilaginous coronoid process—the main factor in preventing backward displacement—is then of small size. The injury is almost always a backward displacement of the ulna and radius from the lower end of the humerus, the two bones of the forearm maintaining their relative positions to each other. Lateral and forward displacements also occur, and occasionally the ulna alone is dislocated backwards, the relationship of the radius and humerus being unchanged. Dislocations of the radius are considered separately.

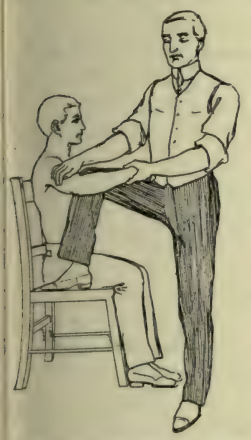


Fig. 19.—Reduction of Dislocation of Elbow.

Reduction.—An anæsthetic is usually unnecessary. The 'knee' method is applicable to all the above-mentioned dislocations except that in the forward direction. The patient sits in a chair, and the surgeon, resting his foot on the chair, places his knee against the front of the lower end of the humerus. Holding that bone steady with one hand, he flexes the patient's forearm with the other, which seizes the limb at the wrist (*Fig.* 19). The lateral aspect of the surgeon's knee acts as a fulcrum, and the flexion of the forearm levers the upper end of the ulna away from the humerus until the coronoid process is disengaged, when the bones slip into position. The forward dislocation may be reduced by pushing the forearm firmly backwards whilst keeping it fully flexed.

After-treatment.—The arm should be kept in a sling, and active movements limited for two or three weeks. Passive movements and massage may be undertaken at once.

Unreduced Dislocations.—If a dislocation has remained unreduced for a period of more than a month, replacement is unlikely, and is accompanied by considerable risk. Up to the time mentioned the method above described may be employed under an anæsthetic, preceded by movements to break down adhesions. If these fail, or if lapse of time has rendered the attempt inadmissible, operation should be resorted to in cases in which the general condition of the patient is favourable and a movable elbow of importance. The operation called for is an excision of the elbow, and it gives satisfactory results.

The Upper End of the Radius.—As a result of falls on the hand, dislocations of the upper end of the radius may take place in a forward or backward direction.

Reduction is sometimes readily accomplished without an anæsthetic by flexing the forearm to a right angle, and pulling upon it in that position whilst the thumb of the other hand makes direct pressure in the requisite direction upon the displaced radial head. Sometimes the orbicular ligament fills up the lesser sigmoid cavity and renders reduction very difficult. If manipulation under an anæsthetic fails to effect a satisfactory replacement, open operation is necessary. This should not be delayed, as the operative treatment of an old unreduced dislocation does not give favourable results.

After-treatment.—Some care is called for to prevent the recurrence of the displacement. The elbow is kept fully flexed upon a poroplastic splint for three weeks. After a few days, however, the splint may be removed daily for the purpose of careful massage and passive movements in the direction both of extension and rotation.

Dislocation of the Radius Downwards.—'Pulled-elbow' results from the practice of dragging children along by the hand. The radial head is separated from the capitellum of the humerus, and a portion of the orbicular ligament slips in and becomes nipped between the articular surfaces. The child cries with the pain and keeps the elbow semi-flexed, whilst tenderness and swelling are noted on examining the joint from behind.

Reduction.—Fully flex the limb, and, after keeping it in that position for a few moments, rapidly extend it. No after-treatment is needed beyond controlling the movements of the joint for a day or two.

Wrist.—This injury is of rare occurrence. The carpus passes backwards from the radius.

Reduction is readily effected by pulling upon the hand.

After-treatment.—The forearm and hand are placed upon a well-padded straight splint, and are lightly bandaged to it. The splint must not reach beyond the metacarpophalangeal joint, and the fingers must be left free. Passive movements of the fingers are begun at once and persevered in. Passive movements of the wrist are begun after five or six days, but the patient must not be allowed to use the hand for a month.

Metacarpophalangeal Joint of Thumb.—The first phalanx passes backwards on to the dorsum of the head of the metacarpal bone, which projects into the palm of the hand. The tendon of the long flexor muscle may become hitched round the neck of the metacarpal bone, which is also embraced by the short flexor tendons and the torn glenoid ligament.

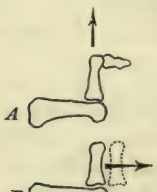


Fig. 20.—Showing position of bones in reduction of Metacarpophalangeal Joint of Thumb.

A.—Traction exercised in the direction of the dislocated first phalanx.

B.—The base of the phalanx drawn forward until it is level with the head of the metacarpal bone.

C.—Reduction completed by flexing the thumb into the palm.

Reduction may usually be accomplished by the following method (*Fig.* 20): An assistant fixes the hand and metacarpal bone. The surgeon then grasps the thumb and bends it back to a right angle. He then drags upon it in its hyperextended position, at

the same time pressing the head of the metacarpal backwards. Having thus 'unlocked' the displacement, he draws the base of the phalanx forwards until it is level with the end of the metacarpal, and then rapidly flexes the thumb into the palm. Traction upon the thumb may be rendered easier by employing a clove-hitch of soft bandage, or one of the special instruments sold for the purpose. If reduction by this method fails, a tenotome, with the sharp edge towards the extremity of the thumb, is introduced in the middle line behind the joint just above the base of the phalanx. The point of the knife is then made to pass onwards towards the palm between the short flexor tendons. Next the blade is made to cut on to the base of the phalanx, thus dividing the glenoid ligament, which, running across between these tendons, is the chief obstacle to reduction.

Hip.—When the head of the femur is dislocated from the acetabulum, it follows, as a rule, certain definite paths, and comes to lie more or less exactly in one of four positions. These are known as the four 'regular' dislocations. It may be, however, that the severity of the injury is such as to cause very great and widespread laceration of the soft parts around the joint. It is upon the comparative integrity of these soft parts, and more especially of the Y-shaped ligament of Bigelow, that the regular course of the displaced head depends. If this ligament be ruptured, the head of the femur may assume almost any position around the acetabular cavity, or even remote from it. The limb assumes no definite position, movements may be abnormally free and flail-like, and there is usually little difficulty in reduction. These latter are known as the 'irregular' dislocations, and will not be further dealt with.

Regular Dislocations.—(1) *Dislocation on to the Dorsum Ilii* : the limb assumes a position of flexion, adduction, and internal rotation. The head of the femur may be



Fig. 21.—Reduction of Dislocation of Hip by Method (1).



Fig. 22.—Reduction of Dislocation of Hip by Method (2).

felt above and behind the acetabulum. *N.B.*—When the femoral head is forced directly back, the displacement may be associated with a fracture of the posterior margin of the acetabulum. (2) *Dislocation into the Sciatic Notch* : flexion, adduction, and internal rotation are all present, but are less marked than in the preceding class. The head of the bone is behind the acetabulum, but owing to the greater thickness of the gluteal muscles it is less easy to feel. (3) *Dislocation into the Thyroid Foramen* : the limb is to a slight extent flexed, abducted, and externally rotated. The head of the bone may sometimes be felt in the perineum. (4) *Dislocation on to the Pubic Bone* : flexion, abduction, and external rotation are each rather more marked than in the thyroid displacement, whilst the head of the bone is readily felt lying beneath or above Poupart's ligament.

Reduction.—The patent lies on his back on a mattress placed on the floor, and is anæsthetized.

For Dislocations on to the Dorsum Ilii or into the Sciatic Notch, the following methods should be tried : (1) The surgeon stands near the foot of the patient, facing his head ; he grasps the affected limb with one hand below the knee, with the other at the ankle (*Fig.* 21) ; he then fully flexes the hip, maintaining the adducted position, and next abducts, externally rotates, and finally extends the limb with one sweeping movement. It sometimes happens that this method fails, a click being felt as the movements of abduction and external rotation are being carried out, indicating that the head has once more slipped back into its former dislocated position. In these circumstances the following plan should be tried. (2) The surgeon stands over the patient, facing his head, and flexes

the hip-joint to a right angle. The flexed leg of the patient is between the thighs of the surgeon (*Fig.* 22), who bends forward and folds his forearms beneath the patient's knee. Then, whilst an assistant holds the pelvis firmly down to the mattress, the surgeon exerts strong traction directly upwards.

For Thyroid and Pubic Dislocations.—(1) The surgeon, grasping the leg as in method (1) above, flexes the thigh in its abducted position. With one continuous movement he then internally rotates and adducts the limb, finally extending and bringing it down beside its fellow. (2) Thyroid dislocations may be reduced in a manner similar to method (2) above, the limb being, however, slightly abducted, and traction exerted in an upward and outward direction.

After-treatment.—The patient is kept in bed for a fortnight with a Liston's long splint applied. At the end of this time massage is begun, and passive movements are carried out daily. Active movements are allowed a week later, and at the end of a month the patient may be allowed up on crutches. Work may be resumed as a rule at the end of two months. When there has been extensive laceration of muscles and ligaments, weakness of the limb and lameness may continue for a long time; whilst should the sciatic nerve have been injured, there may be paralysis and wasting of muscles. Massage, movements, and galvanism should then be employed assiduously. In the cases referred to where there is a fracture of the acetabular margin, there is a tendency for the dislocation to return, and rest must be considerably prolonged.

Knee.—Displacements rarely occur at this joint. The tibia may pass forwards, backwards, or laterally. The latter is the more common variety, the displacements being usually incomplete, and the border of the tibia resting between the condyles of the femur.

Reduction should be performed under an anæsthetic. The thigh is flexed, and traction is made upon the leg. The replacement is aided by direct manipulation and by rotation of the limb.

After-treatment.—The limb is placed on a back splint for three weeks, and passive movements are then begun. Permanent weakness of the joint is apt to remain, and there may be persistent œdema of the foot and leg.

Patella.—This is a very rare dislocation. The patella usually passes outwards, so as to lie upon the external condyle.

Reduction.—Flex the thigh fully on to the abdomen, and extend the knee. The extensors being thus relaxed, direct manipulation effects replacement.

Unreduced Dislocations.—In cases of old-standing unreduced dislocations of the patella, generally due to genu valgum rather than to injury, excellent results are given by transplanting the tubercle of the tibia, with the insertion of the ligamentum patellæ, from the front to the inner aspect of the bone. In less severe cases, incision through the capsule on the outer side of the patella and excision of an elliptical portion on the inner side, with suture of the gap left, will suffice.



Fig. 23.—Reduction of Dislocation of Ankle.

Ankle.—Lateral dislocations do not occur without fracture, and are considered under the heading of Pott's Fracture of the Fibula (*see* Fractures). The backward dislocation is commoner than the forward, and may be accompanied by fracture of one or both malleoli.

Reduction is effected by pulling upon the foot, with the knee fully flexed to relax the gastrocnemius (*Fig.* 23). If this be ineffectual, even under an anæsthetic, the tendo Achillis should be divided subcutaneously.

After-treatment.—The limb is put on a back splint with a foot-piece, care being taken to keep the foot at a right angle. Massage is begun after three days, the splint being removed for the purpose. The splint is dispensed with at the end of three weeks.

Astragalus.—The astragalus, when dislocated, is displaced both from the tibio-fibular mortice and from the upper surface of the os calcis. The dislocation may be complete or incomplete, in the former case being often compound.

Reduction may be sometimes accomplished in the incomplete forms. An anæsthetic is given, and direct pressure in the requisite direction is made on the astragalus whilst

the foot is firmly pulled upon. During these manipulations the knee is well flexed to relax the tendo Achillis, or that structure may need division. In the complete forms reduction is impossible, and excision of the astragalus should be performed through a free incision.

After-treatment.—The limb is put on a back splint, the foot being kept at right angles. Massage is begun after three days, and passive movements after a fortnight. When the astragalus has been excised, massage and movements are commenced as soon as the wound is firmly healed.

Subastragaloid Dislocation.—In this injury the astragalus retains its position with regard to the tibia and fibula, whilst all the other bones of the foot are displaced from beneath it, usually in a backward direction.

Reduction should be attempted by pulling the foot forwards whilst counter-pressure is made on the front of the lower end of the tibia. During this procedure an assistant keeps the knee well flexed. In difficult cases the tendo Achillis, and possibly also the tibial tendons, may need division. When reduction fails, the astragalus should be excised. This will admit of the foot being placed in a fair position.

After-treatment should be carried out as for dislocation of the astragalus.

Spine.—(*See* Spine, Fractures and Dislocations of.) *S. Maynard Smith.*

DISSEMINATED SCLEROSIS.—The treatment of disseminated sclerosis has been in the past most unsatisfactory; indeed, it is doubtful whether recovery or permanent arrest ever takes place. Since the pathology of the disease has been obscure, it follows that no rational line of treatment has been available; recent observations, however, suggest that the disease may be due to a spirochæte. Therapeutic deductions are necessarily very difficult, because of the remissions which are apt to occur quite apart from intervention. The first aim in treatment consists in the avoidance of influences which experience has shown to have a deleterious effect. Fatigue especially is to be guarded against, although prolonged rest in bed is not advisable. In the case of married women, the dangers of child-bearing are to be clearly pointed out, for there can be no question that the disease is often greatly aggravated by pregnancy. Sufferers from disseminated sclerosis should be warned as to the risk of exposure to infectious diseases, and particularly to influenza, which often aggravates the symptoms.

No known drug is universally admitted to modify the course of disseminated sclerosis. Among the many remedies, the effects of which have been from time to time extolled in this disease, arsenic has perhaps been most largely used. The writer is inclined to think from his experience that this drug is, at times, undoubtedly of value. It may be conveniently given in the form of Fowler's solution in doses of from 2 to 6 min., three times a day, and its administration should be continued for several months. A recent observer affirms that he has treated early cases of disseminated sclerosis by intravenous injections of sodium silver salvarsan, in doses of from 0·1 to 0·15 grm. in 10 c.c. of water, with marked improvement; and suggests that if disseminated sclerosis is ultimately proved to be due to a spirochæte, this treatment may be expected to be as specific for it a ssalvarsan is for syphilis. Silver nitrate and potassium iodide are, it is affirmed, sometimes of value. Risien Russell is "satisfied that many cases improve under inunctions of mercury, provided that this treatment is combined with a great deal of physical rest and a liberal diet modified on the lines adopted in a rest cure". Judson Bury has "thought that the administration of suprarenal extract has done good". Neither fibrolysin nor salvarsan appears to be of use. Strychnine is contra-indicated, since it undoubtedly tends to increase the spasticity. Indeed, the rapid improvement in walking which is not uncommonly observed in cases of disseminated sclerosis after admission to hospital, is usually to be attributed to the cessation of the strychnine which many practitioners are still in the habit of prescribing in all organic nervous affections. It is very doubtful whether electricity is of the slightest value, while it is also open to question whether the *x* rays are of any service. When spasticity is pronounced, it may sometimes be relieved by massage and passive movements. Veronal may be found to be occasionally helpful in alleviating the flexor spasms in the lower extremities which are at times so troublesome. In the later stages, the usual precautions are to be taken to avoid the occurrence of bed-sores and cystitis. (*See* Paraplegia.) *Edwin Bramwell.*

DIVERTICULITIS OF THE COLON.—This condition is often described under the heading pericolitis, or pericolitis sinistra. It is a curious condition, characterized by the formation of small pouches or hernial protrusions of the mucous membrane of the colon through its muscular walls. These protrusions vary from minute canals to quite large tubes resembling the appendix or a Meckel's diverticulum. They usually find their way into the appendices epiploicæ, or between the layers of the mesocolon. Fæcal material gradually spreads from the bowel lumen into these pouches, and the apex of each pouch generally contains a fæcal concretion. In a well-marked case of this disease many hundreds of these pouches may be found in quite a small section of the bowel. As a rule the disease is confined to elderly subjects, and appears to be the direct result of chronic constipation. It most commonly occurs in the lower part of the colon, and particularly in the sigmoid flexure. Inflammatory changes, with subsequent fibrosis, take place in the wall of the affected bowel, and in course of time a considerable degree of stricture and tumour formation occurs. The condition is frequently mistaken for malignant disease of the large intestine. Occasionally one of these pouches ruptures, with the consequent formation of an intra-abdominal abscess, or acute general peritonitis. Chronic obstruction of the colon, accompanied by the presence of a tumour of indefinite outline in the left iliac fossa, and occasional inflammatory attacks, with a rise of temperature, are the usual symptoms of this condition. As already stated, the condition is mistaken for cancer, but its true nature may be suspected if there are inflammatory symptoms. An occasional complication is perforation into the bladder and the passage of flatus and even fæces per urethram, accompanied, of course, by a severe cystitis. Nearly all the cases of vesico-colic fistula are due to diverticulitis, and not, as is often supposed, to malignant disease. So closely do these cases resemble malignant disease of the colon, that even a surgeon who has opened the abdomen may be misled unless he carefully looks for the diverticula. Often large hard tumours are formed, due to the deposit of fibrous tissue around inflamed diverticula. The diagnosis can sometimes be established by means of the *x* rays or the sigmoidoscope.

The only treatment, apart from operation, offering any hope of amelioration, consists in keeping the contents of the colon as soft as possible by the administration of petroleum by the mouth, assisted by the use of aperients and enemata. The proper treatment for this condition is resection of the affected portion of the large intestine. This is, however, often impossible owing to extensive adhesions to surrounding structures. When resection is impossible, the affected portion of the colon should be short-circuited, either by lateral anastomosis or by an ileosigmoidostomy. If the disease is situated so low down as to negative both of these alternatives, colostomy should be performed in healthy bowel above the tumour. Diverticulitis is a very serious condition and often proves fatal. If, however, colostomy is performed above the area of disease, complete recovery follows, provided the condition has not progressed too far; that is to say, to the formation of abscesses. The colostomy will have to be permanent in most cases, but the author has many patients in excellent health years after the operation. Perforations into the bladder heal up quite satisfactorily after the fæces are deflected by colostomy.

J. P. Lockhart-Mummery.

DROPSY, CARDIAC.—(*See* HEART, VALVULAR DISEASES OF.)

DROPSY, RENAL.—Certain forms of chronic renal disease are accompanied by dropsy, and in many instances, but not in all, this calls for treatment apart from the general treatment of the disease. Dropsy in renal disease may be purely of renal origin, but in some instances it is of secondary cardiac origin and associated with cardiac dilatation, the result of so-called failing compensation.

Whether the dropsy be renal or cardiac in origin, it is always accompanied by a diminution in the flow of urine. This diminution, however, is not always the cause of the dropsy, and it is a most important point as regards the treatment of the condition, for the question whether diuretics should or should not be given turns on the question whether the scanty flow of urine is the cause or the result of the dropsy. It is useless to give diuretics if the condition of the kidney is such that it is unable to eliminate water; on the other hand, diuretics may be of some service if the dropsy is dependent on a primary

blood-change leading to increased transudation of fluid through the walls of the vessels. It certainly cannot be said that diuretics are always contra-indicated in chronic Bright's disease associated with dropsy. At the same time, treatment should be directed, not only to promoting the excretion of water by other channels, in addition to the kidney, but also to preventing as far as possible the development of the dropsy itself.

The promotion of the excretion of the dropsical fluid by other channels than the kidney, for instance the bowels and the skin, necessitates the re-absorption of the dropsical effusions into the blood-stream, and these dropsical effusions contain large quantities of toxic material. Thus it is not as a rule advisable to employ measures which act suddenly and violently, to effect this purpose. There is a considerable amount of evidence to show that the quantity of chlorides present in the food and in the blood-stream has a material influence in increasing any dropsy present, and possibly may even cause it. The urine, in cases of tubal nephritis associated with dropsy, may eliminate chlorides with difficulty, and it has been shown that the administration of chlorides to these patients is liable to be followed by an increase in the dropsy. This increase may not only be detected by physical examination, but it is often sufficiently rapid and marked in amount to show itself by an increase in the body-weight of the patient. It is not difficult to restrict the amount of chlorides in the food, by avoiding their use as a condiment in cooking, and by ordering a diet that is poor in chlorides. In some cases of chronic nephritis with persistent dropsy, very beneficial results may be seen to follow the restriction of the amount of chloride of sodium in the diet, and in some cases the dropsy may entirely subside with a diet reducing the intake of sodium chloride to a minimum. Bread made without salt must be used, and the bulk of the food must consist of vegetables cooked without salt, but meat may be allowed provided always that no salt be taken with it. Certainly this method of treatment would seem desirable in cases where dropsy is marked and increasing. Although it is useless to treat dropsy by an undue restriction of the amount of fluid ingested, it is often useful in chronic cases to avoid giving large quantities of milk and other fluids which may lead to the production of a hydræmic plethora, and such patients may do better on a diet of solid food, meat and bread. This is especially suitable in cases of chronic parenchymatous nephritis, even when the dropsy is considerable in amount. Such a diet is unsuitable in cases of granular kidney with dropsy of the cardiac type.

The excretion of water by other channels than the kidney must be promoted by moderate purgation, as already explained, and, to a limited extent, by measures directed to bring about sweating. In chronic renal disease it is often difficult to produce sweating, and generally the best results are obtained by moderate measures, such as warm or hot-air baths, where the temperature is not unduly raised. Hot-air baths may be readily given by the use of electric lights of twenty-five candle-power, suspended in a cradle covered by blankets. Uræmic symptoms, and even fatal uræmia, have been known to occur as a result of the indiscriminate use of hot-air baths of high temperatures, and it is possible that such effects may result from the sudden absorption of large quantities of the dropsical exudation associated with the copious sweating. Hot-air baths should be used with the idea rather of promoting a gentle action of the skin than of procuring the subsidence of large dropsical effusions. Pilocarpine is sometimes recommended in such cases, and it is of course possible to produce profuse sweating by this means ; but there is always the risk of causing considerable pulmonary embarrassment, owing to the copious secretion from the bronchial tubes seen under the influence of this drug, and in free doses it may also lead to the development of cardiac weakness, and on the whole its use is not to be recommended for the relief of dropsy.

Very striking results can often be obtained by the use of diuretics. Acetate, citrate, and nitrate of potash are of service, but one of the most useful diuretics in chronic renal disease is caffeine, if it be used in small doses and intermittently. Caffeine is a powerful diuretic ; but its action is peculiar in the fact that the best diuretic results are seen when small doses are given. Large doses, and frequently repeated doses, tend to produce an opposite effect to that seen with small quantities, and it is not uncommon, where the drug is continually administered, for a diminution in the amount of urine to occur, associated with the development of headache, sickness, and other unpleasant symptoms. Caffeine in very large doses may even produce suppression of urine, and this is not an uncommon

result in the laboratory after its experimental administration. Clinically, it not uncommonly produces a diminution in the flow, together with headache and vomiting. If the drug is administered in small doses and intermittently, only good results are obtained. It may be given in 5-gr. doses of the citrate every four hours for three or four doses; the administration should then be stopped for twenty-four or forty-eight hours, and then the drug given again. In this way a notable diuretic effect may be produced. It is often useful to combine with the citrate of caffeine small doses of digitalis, which, although not a diuretic in the strict sense of the term, may produce an increased flow of urine, thanks to its action in improving the circulation. Digitalis is not always advisable in cases of renal disease associated with considerable high tension, owing to its well-known action in increasing the blood-pressure. Indeed, in all cases of chronic Bright's disease, the administration of diuretics must be largely determined by the results seen. If the giving of a few doses of caffeine is not followed by any beneficial diuretic effect, no useful purpose is served by persisting in its administration. Broom tops, squills, and other drugs of a similar kind, are often also useful. Where the amount of dropsy is large, and especially where it is refractory to treatment along the lines indicated, it is best to remove the fluid by Southey's tubes. There is no objection to the use of these in renal disease, provided care be taken to make and treat the punctures aseptically. In cases of generalized anasarca, with fluid in the pleural and peritoneal cavities, puncture of the legs with Southey's tubes is often sufficient to procure relief generally; but if this is not the case, the collections of fluid in the chest should be removed by paracentesis, which should be performed slowly, owing to the well-known tendency to the development of pulmonary œdema in this disease and the risk of this complication occurring as a sequel to the too rapid drawing off of a pleural effusion. (*See also* NEPHRITIS.) *John Rose Bradford.*

DROWNED, TREATMENT OF THE APPARENTLY.—Place the patient face downwards on the ground, preferably with a folded coat under the lower part of the chest. Do not lose time in attempting to remove his clothing. Begin artificial respiration by the Schäfer method as follows:—

1. Place yourself athwart or on one side of the patient's body in a kneeling posture and facing his head.

2. Place your hands flat over the lower part of the back (on the lowest ribs), one on each side, and gradually throw the weight of your body forward on to them so as to produce firm pressure—which must not be violent—upon the patient's chest.

3. Raise your body slowly so as to remove the pressure, but leaving your hands in position.

4. Repeat this forward and backward movement every four or five seconds.

This course must be pursued for at least half an hour, or until the natural respirations are resumed. When breathing has been established, the patient may be turned on his back and active means employed to promote the circulation, by friction of the limbs in a direction towards the heart, and by the application of hot flannels, hot bottles, etc. As soon as the patient can swallow, small quantities of wine, warm brandy and water, beef-tea, or coffee may be administered. He should then be put to bed and encouraged to sleep.

Robert Hutchison.

DRUG HABIT.—The most important drug habits are the abuse of morphine and cocaine. Alcoholism is dealt with in a separate article. The cocaine habit is even more serious than the morphine habit, and more difficult to eradicate.

In the treatment of morphinomania or cocainomania it is a *sine qua non* that the patient should be removed from his own home to some special institution where he can be under continuous observation and control. Nothing must be left to his own good-will. If left to himself, he will break the most solemn pledges with the utmost callousness.

One has then to decide whether an attempt shall be made to stop the drug suddenly, or whether its dose shall be gradually reduced day by day. Experience shows that sudden stoppage is rarely tolerated, and is only feasible in the mildest cases, where the habit has been of comparatively short duration, and the dose has not been large.

Even the 'rapid' method, where the dose is reduced progressively so as to reach zero within six or twelve days, causes the patient great distress, though less than by the sudden method. Best of all—in the absence of specific treatment by hyoscine, to be described

presently—is the gradual method, in which some six weeks are occupied in reducing the dose to zero. One way of accomplishing this is to make a solution, say 1 oz., of the full strength of the drug to which the patient has been accustomed, and for every syringeful withdrawn from the bottle, to replace a corresponding quantity of boiled water. The strength of the solution is thereby gradually reduced until at last the patient gets an infinitesimal dose of the drug.

During the process of demorphinization or decocainization, one of the chief difficulties is insomnia. To combat this it is usually necessary to administer hypnotics. For this purpose one may employ full doses of trional, 30 or 40 gr. at a time. Or one may follow Neil Macleod and deliberately induce bromide poisoning by enormous doses of sodium bromide, up to 1 oz. twice daily. A state of narcosis is thus produced, from which the patient awakes, probably in an excited, delirious condition, but having lost his craving for the drug. By this method it is claimed that three days are often enough to produce the full effects.

But amongst physicians who have opportunities of observing the progress of morphine *habitués*, it is the universal experience that treatment by simple withdrawal of the drug, however gradually this be done, is always associated with intense suffering to the patient. And it must be admitted that the percentage of cures thus obtained is not a large one. Within recent years, however, a more efficacious method of treatment has been elaborated, which consists essentially in the administration of massive doses of hyoscine, pushed to the point of producing a mild delirium.

Briefly the routine pursued is as follows: The patient must be secluded in a special home, in a quiet room, away from other patients. He is put to bed, and reliable nurses must be in constant attendance day and night for the first few days at least. The medicinal treatment commences with $\frac{1}{100}$ gr. of hyoscine hydrobromate hypodermically. Every hour after this, for twenty-four to forty-eight hours, $\frac{1}{200}$ gr. is administered, watching carefully the pulse and respiration. As a result, symptoms of hyoscine intoxication supervene. They resemble those of the other members of the belladonna group: the pupils become widely dilated, the tongue and throat very dry, and within twelve hours or so the patient develops a mild restless delirium, accompanied by choreiform movements, picking at the bedclothes, and by visual hallucinations referred to various parts of the room. Such visions as a rule are not disagreeable to the patient. When this stage is reached, the hyoscine is continued just often enough to maintain the delirium for twenty-four or forty-eight hours (from $\frac{1}{200}$ to $\frac{1}{100}$ gr. every two or three hours during this period). After this the hyoscine is stopped, and the patient, when his delirium comes to an end, has lost his craving for morphine. During the early part of the hyoscine period, it may be necessary to give a small dose of morphia, $\frac{1}{4}$ gr., once or even twice. This will not affect the ultimate result. As a rule, hyoscine alone is all that is required. Strychnine may, however, be added ($\frac{1}{60}$ gr. occasionally) to sustain the heart, if necessary. During the period of delirium, the patient should have water to drink, to relieve the dryness of his mouth and throat.

After thirty-six or forty-eight hours of artificial hyoscine delirium, the drug is discontinued, and in a few hours the patient is mentally clear again. Then begins a second phase of the treatment, which consists in regular hypodermic administration of pilocarpine, $\frac{1}{8}$ gr. every hour, to produce sweating, and thereby to favour elimination of the hyoscine, gradually increasing the intervals between the pilocarpine injections. Joint-pains, especially in the knees and elbows, also pains in the back, and diarrhœa, tend to develop at the end of this period. The diarrhœa is checked by a mixture containing bismuth salicylate 60 gr., with fluid extract of coto bark 6 min., suspended in mucilage or syrup. The pains are alleviated by massage, hot baths, or galvanism. If the patient is sleepless, 30 gr. of bromide of potassium, combined, if necessary, with 10 gr. of chloral hydrate, may be required. After the pilocarpine stage is over, great benefit is obtained by general massage daily for a fortnight. Bromaurum, in 10-min. doses thrice daily, is also of distinct advantage, and should be persevered with for two or three months.

The results of such treatment have been most gratifying. It necessitates, however, careful supervision by the physician. Certainly, by this method the danger of collapse from withdrawal of morphia is obviated. And the large number of successful cases which have now been recorded has been sufficient to place the method beyond the experimental stage.

James Purves Stewart

DUODENAL ULCER.—When duodenal ulcer has been diagnosed, the first question that arises is, should the case be treated by operation? Although some surgeons regard every case of duodenal ulcer as requiring operation, the opinion more generally held is that if the symptoms be not of long duration, if there be no evidence of obstruction in the duodenum, and if there has not been any hæmorrhage, a course of medical treatment should first be tried. Such treatment is as follows: The patient must go to bed for at least four weeks. During the first week hot fomentations, changed every two hours, should be applied to the abdomen; during the night cotton-wool and a binder may be worn. The diet in the first week should consist of milk (8 oz. every two hours from 8 a.m. till 10 p.m.), with two beaten-up eggs in the day. In the second week the fomentations may be discontinued, and Benger's food, custard, jellies, and boiled rice added to the diet. In the third week, lightly-cooked eggs, fish, and chicken panadas may be allowed, with stale bread or rusks. The food should be arranged in three meals with milk between, and an ounce of cream should be given before each of the chief meals. From the beginning of the treatment a small teaspoonful of a powder consisting of equal parts of bicarbonate of soda, bismuth carbonate, and heavy carbonate of magnesia should be given in a little milk, every two hours during the day. If this renders the bowels too loose, the magnesia may be omitted or calcium carbonate substituted for it, and if there be constipation, a teaspoonful of Carlsbad salts may be given in a tumblerful of warm water every morning. After four weeks of such treatment the patient is allowed up on a couch, and then gradually begins to get about, and, later, should go away for a change. For some months afterwards the diet must be very simple and unirritating; food should be taken at short intervals, all indigestible articles and sour or highly seasoned foods, as well as alcohol and tea, being avoided; bismuth should be taken regularly to prevent hyperacidity of the gastric juice. Attention must also be paid to careful mastication, to the hygiene of the mouth, and to the avoidance of chill and over-fatigue. (*See also* HYPERCHLORHYDRIA.)

The above may be regarded as the routine 'cure' for such a case, and if after its thorough employment the symptoms recur with any severity, operation should be advised.

A special method of treatment has been advocated by Hort, which consists essentially in giving a full meat diet (to 'fix' the acid of the gastric juice), with the administration of a special antilytic horse-serum (Allen & Hanburys) in 10-min. doses in ½ ounce of water by the mouth, on a full stomach, four times a day (to counteract the digestive action of the ferments). In all severe cases the use of the serum should be continued for six weeks. Complete rest in bed for two or three weeks is insisted on. As regards diet, no milk, soup, or fish in any form is allowed from first to last. For the first three or four days small meals are given every three hours during the day; no meals at night. These consist, in rotation, of small quantities of stale bread, the yolks of lightly cooked eggs, and panada or quenelle of chicken. The only liquid allowed is 10 oz. of hot water at 7 a.m., 11 a.m., and 10 p.m. If all goes well, at the end of four or five days the dietary is doubled in quantity. On the seventh or eighth day pounded meat, lightly cooked, is added. By the end of the second week, meat forms the chief food, and the meats chosen are beef and mutton. In three weeks from the commencement of treatment full diet is generally well borne, but alcohol, soup, tea, coffee, and all starchy puddings are forbidden for six months. The writer has had no experience of this method of treatment.

As regards complications, *perforation* of course calls for immediate operation. *Hæmorrhage* should be treated on the same lines as hæmatemesis (q.v.), food by the mouth being withheld and a pint of normal saline given by the bowel twice a day. Morphia may be used for restlessness. Styptics are of doubtful utility, but adrenalin (1–1000) in 10-min. doses may be tried by the mouth, and 20 gr. of calcium chloride added to each enema. Gelatin has also been recommended: 5 drachms of gelatin should be boiled in water for six hours, and the solution brought up to 5½ oz. It should remain fluid, and when cold be filtered, and 30 gr. of citric acid added. One or two teaspoonfuls of this may be given every two hours. Sterile horse-serum in 10-c.c. doses subcutaneously or injections of hæmoplastin are also of value.

Should the bleeding persist, or the patient begin to show any signs of exhaustion, operation should be performed, transfusion being carried out first if necessary.

Robert Hutchison.

SURGICAL TREATMENT.

These patients have usually suffered for years before coming under surgical supervision. To attempt to cure by medical treatment after the first attack is futile; delay should not be countenanced—the danger of perforation and hæmorrhage in cases of chronic duodenal ulcer is considerable.

Treatment consists in performing a posterior no-loop gastrojejunostomy. At the same time the whole abdomen should be thoroughly explored, and any disease found dealt with. This applies particularly to the gall-bladder, appendix, and ileocæcal region. Great care should be exercised in the after-treatment; the patient should not be hurried to return to solid food, but rather restrained, and every effort made to keep gastric acidity low. If this was excessive before operation, it is wise to examine again at the end of three months to see if the measures that are being taken are efficient. Patients after operation are apt to over-indulge, particularly if they have been dieted, and unable to take their usual food without great discomfort.

Hæmorrhage.—This is a late and serious complication. If severe, operation should be carried out as soon as possible after the first hæmorrhage; this is usually within thirty-six hours. In these cases the ulcer is generally situated on the posterior wall, and the gastroduodenal or superior pancreatico-duodenal artery is the source of the bleeding. The anterior wall of the duodenum should be infolded, and the gastroduodenal artery tied; or, if from the presence of coincident anterior ulceration or adhesions this cannot be satisfactorily performed, the gut should be opened and the vessels tied. Posterior gastrojejunostomy should always be performed at the same time.

Perforation.—The ulcer which perforates is usually a chronic one. In many of my cases the patient had been under treatment for a considerable time.

There are two types: those in which the diagnosis of perforation of a peptic ulcer is certain from the sudden onset of symptoms; and those in which the onset is more gradual, the symptoms which bring the patient under observation being those of a subphrenic abscess, or resembling somewhat those of appendicitis.

Operation should be carried out at once, the perforation closed, and posterior gastrojejunostomy performed, except in the rare instance of the perforation of an acute ulcer or in late cases. After examining for further perforations, any extravasated fluid should be gently wiped away and the abdomen closed. If there is much peritoneal soiling, the right kidney pouch, and if necessary the pelvis, should be drained.

In all my patients in whom a gastrojejunostomy was not done at the time of closure of the perforation, this had to be carried out later for recurrence of symptoms. I have also had to do this in eight cases after the perforation had been closed by other surgeons. If drainage has been necessary, the tubes can usually be removed within thirty-six hours. If for any reason it was impossible to perform gastrojejunostomy at the first operation, and the ulcer was a chronic one, this should be carried out later. *James Sherren.*

DUPUYTREN'S CONTRACTURE OF THE PALMAR FASCIA.—The pathology and treatment of this condition have been worked out recently by Mr. Jonathan Hutchinson with the completeness and success associated with any work he takes in hand, and the treatment of a condition which previously taxed the surgeon's ingenuity has been much simplified. He has pointed out that by the time a severe case of this contracture comes to the surgeon, secondary changes have taken place in the glenoid and lateral ligaments of the proximal interphalangeal articulation, and in order completely to extend such a finger it is necessary to excise the head of the proximal phalanx.

Etiology.—The precise etiology is still obscure. Gout, rheumatism, and syphilis have all been quoted as etiological factors, but certainly medicinal treatment directed against these disorders has no influence on the progress of the condition. It is a disease of men over 35 years of age, and in a large proportion of cases there is a history of repeated and prolonged pressure on the palm from the handles of chisels or tools of some kind.

Diagnosis.—It should not be confused with congenital contracture of the fingers, for the latter dates from birth or soon after. It should not be confused with shortening of the flexor tendons, for the affected finger cannot be extended more when the wrist is flexed. It should not be confused with an ulnar nerve lesion, in view of the other physical signs of a nerve lesion.

Treatment.—*Non-operative treatment* cannot be recommended. The lesion might be prevented from getting worse by wearing a splint at night, but neither a man of leisure nor a working-man finds he has time after a few weeks to bother about his splint. The application of a splint to correct the deformity is bad surgery, whatever we may think about the application of a splint to maintain correction by other means. If the splint be applied to correct the deformity with any degree of pressure, there is a big risk of sloughing over the tips of the fingers and the knuckles. The application, too, of splints in men of the type which develop this contracture is very liable to be followed by permanent limitation of movement in the joints involved in the splinting.

Operative Treatment.—The thickened fascia must be excised; attempts to do this under local anæsthesia are not satisfactory, and therefore a general anæsthetic is advisable. The incision is a straight one in the palm. Plastic operations of the V-Y type are not good, because the apex of the flap is liable to slough. This sequela must be followed by a tendency to contraction of the scar, or the palm must be skin-grafted—an unsatisfactory procedure.

The thickened fascia is excised as completely and thoroughly as possible, respecting the integrity of the digital vessels and nerves. An attempt is now made to extend the affected fingers. In a case of some duration complete extension is not yet possible; the wrist must be flexed to relax the flexor tendons, and a further attempt made to straighten the finger. The flexion of the wrist will not have influenced the amount of extension possible, and the operation must be completed by removal of the head of the proximal phalanx, this joint being the one most commonly showing the maximum deformity. A good firm dressing is all the splint required after the operation, and passive movements may be commenced in three or four days. Active movements are allowed at once, the patient being encouraged to move the finger in the short range allowed by the dressing, and, as soon as the stitches are removed, more extensive active movements are encouraged.

There is no doubt that some patients have ultimately had a less useful hand after an operation for this contracture, because a splint was applied afterwards and led to stiffening of the joints. — *Robert Milne.*

(*See also* Electrotherapeutics, p. 281.)

DYSCHEZIA.—(*See* Constipation, Habitual.)

DYSENTERY.—Under this name are included several conditions, distinct probably both as regards etiology and the nature of the lesions produced. Various diseases of the anus and lower part of the rectum are frequently mistaken for dysentery. These include malignant and other chronic diseases of the rectum, fissures, fistula, and bilharzia disease. In such conditions appropriate surgical or other treatment is required.

Acute Dysentery.—Rest in bed, warmth, and low diet are necessary. The diet should be restricted to milk, diluted with one-fourth barley- or rice-water, and given in small quantities, 4 oz. only at a time. Arrowroot, made rather thick, is of decided value. Meat is more deleterious than vegetable food; even green vegetables can be taken with impunity when meat would cause a relapse. If abdominal pain or griping be severe, large hot fomentations should be applied to the abdomen. Straining at stool is to be discouraged. The three main lines of medicinal treatment are by (1) ipecacuanha, (2) saline aperients, and (3) serum treatment.

1. *Ipecacuanha Treatment.*—This is only of use in dysentery due to the *Entamœba histolytica*, upon which the drug has a selective action. Large doses should be given, 15 to 30 gr., repeated after eight hours. Some practitioners give a single dose only on the first day.

In order to check the vomiting, the patient must be kept absolutely at rest; no food or fluid should be given for an hour or more before the administration of the drug. He must be instructed not to swallow his saliva. Laudanum (15 min.) or chloral hydrate (20 gr.) should be given, twenty minutes before the ipecacuanha is administered. The ipecacuanha may be made up into conveniently sized pills, which may be coated by dipping into melted salol, or the ipecacuanha powder can be suspended in water or dilute syrup, and swallowed. If vomiting result, the dose must be repeated. Where vomiting occurs regularly after the administration of the drug, this may be given as 'membroids'. The

vomiting may still occur, but only after some hours, and in this time much of the effect of the drug has been produced. Sometimes these membroids are passed unchanged. Sinapisms applied to the epigastrium further tend to check the vomiting. On the following day the dose may be reduced by 5 gr. and given once, with the same precautions. In a case progressing favourably, the amount of ipecacuanha given can be reduced by 5 gr. daily. It is well to continue the daily administration of small doses (5 gr.) for some time after apparent convalescence. Return to an ordinary diet must be gradual, and large meals of any kind avoided. Emetine hydrochloride in $\frac{1}{4}$- to $\frac{1}{2}$-gr. doses, given as an intramuscular injection or in keratin-coated capsules, has largely replaced the big doses of ipecacuanha. These doses of emetine should be given daily for one or two weeks, and be followed by the prolonged administration by mouth of small doses (2 to 5 gr.) of ipecacuanha in pills; otherwise relapses occur in the majority of cases. According to other experience all acute cases of amœbic dysentery during convalescence should be given a course of emetine bismuth iodide (generally known as E.B.I.). This drug should be given in gelatin cachets, each containing 1 gr. of the drug. The course should extend over a period of twelve days, during which 3 gr. of the drug should be given every night. The most rigid restrictions as regards diet are necessary, and some preliminary precautions against vomiting, as in the case of ipecacuanha, should be employed. Many prefer the mixed alkaloids in ipecacuanha continued for a longer period.

2. *Treatment by Saline Aperients.*—The usefulness of this method of treatment is generally acknowledged in acute epidemic dysentery due to the dysentery bacilli—*B. Shiga* or *B. Flexner*. In principle it aims at securing a steady intestinal flush with a minimum of discomfort. A convenient method is to give 2 or 3 drachms of a saturated solution of sulphate of soda with 5 min. of dilute sulphuric acid, in a wineglassful of water, every two hours till a liquid fæculent motion is passed, and then increase the intervals between the doses to four or six hours. After the first two days, a dose once or twice a day will suffice. Intestinal antiseptics, such as β-naphthol 10 gr., salol, etc., may also be given. Some practitioners prefer smaller doses of either sulphate of soda or magnesia, at first given hourly. Castor oil or olive oil in full doses, with 10 to 15 min. of laudanum, is preferred by others, and gives satisfactory results in mild cases. Medicinal enemata should not be given in the acute stage.

3. *Serum Treatment.*—This should always be employed in the acute attacks of bacillary dysentery. A polyvalent serum prepared by the Lister Institute is the one most generally employed. If must be given in large doses—80 to 120 c.c.—as early in the course of the disease as is possible. Several methods of injection are available; it is difficult to introduce so large a quantity by the subcutaneous route, though the injection is more easily performed into the adductor muscles of the thigh. Intravenous injection should be reserved solely for the most acute fulminating cases, such as occur in most epidemics of the disease.

Chronic or Relapsing Dysentery.—Here results are less certain, especially in the chronic bacillary forms. The same treatment as in the acute cases often gives satisfactory results, but by no means invariably. If either active amœbæ or cysts of *E. histolytica* are found, a course of emetine bismuth iodide in 3-gr. doses for ten or twelve days will often be beneficial. The relapses are often due to dietetic errors, and frequently to constipation. Constipation after dysentery is not easy to deal with. In many cases it appears to result from an atonic condition of the intestines. Natural waters sometimes suffice. Cascara sagrada and belladonna are more trustworthy. The fluid extract of cascara (5 to 10 min.) with tincture of belladonna (5 min.) in an ounce of chloroform water every night, will often relieve the condition; the dose may then be steadily reduced. In some cases rectified petroleum is most suitable, at first in frequent doses, such as 2 drachms t.d.s., and then as a single nightly dose of 1 drachm to $\frac{1}{2}$ oz. Examination with the sigmoidoscope may show definite ulcers, which can be treated readily.

Bismuth and astringents are of considerable value where diarrhœa occurs with or without mucus. Opium, in any form, must be used cautiously, as the condition of the intestine is often atonic. Increase in flatus often follows its administration, and then it may even aggravate the condition.

In the severer chronic forms, large enemata, given with a long soft flexible tube, are sometimes employed. Before giving these, the intestines should be washed out with a

large (2-pint) enema of weak carbonate of soda solution, 20 gr. to the pint. Of these enemata, boracic lotion is of value; nitrate of silver, ½ to 1 gr. to the ounce, and other stimulating lotions, are also used, and in amœbic dysentery, sulphate of quinine. These enemata should be given very slowly, and must be warm (blood-heat). They should be retained for a longer period each day. They should not be long retained if they cause pain. Where the motions are frequent, the old enema opii B.P. 1885 (*i.e.* ½ drachm laudanum and 2 oz. mucilage of starch) with 20 gr. of quinine sulphate suspended in it, is sometimes of great value, as the quinine is slowly dissolved.

Native remedies must not be despised. Most of these are fresh decoctions, such as those of bael fruit or the skins of the mangosteen; they do not seem to be of much value either after drying or solution in alcohol, though successful when freshly prepared.

Chronic bacillary cases are by no means so easy to treat as are those of the chronic amœbic variety. The most hopeful line consists in the irrigation of the lower bowel on alternate days with a solution of eusol, 1 to 2 pints, combined with a course of vaccine treatment, using emulsions of the organism—i.e., Shiga or Flexner γ bacillus—responsible for the original attack.

Alcohol as a rule is contra-indicated. In intractable cases, surgical intervention—appendicostomy and colotomy—may be advisable. (*See also* COLITIS and SPECIFIC THERAPY.)

C. W. Daniels.

DYSMENORRHŒA.—There are two varieties of menstrual pain, aptly called: (1) *Spasmodic*; and (2) *Congestive.*

1. **Spasmodic Dysmenorrhœa.**—In its most typical form this is either congenital in its origin or starts within a year or two of the beginning of menstrual life; it often increases in severity as time goes on. The pain is spasmodic or cramp-like in character, and begins just before, or at the onset of, the flow. It appears to depend on painful, irregular spasms of the uterine muscle, and, like other painful uterine contractions (i.e., after-pains, labour pains), is felt in the hypogastrium, in the sacral region, and, often, down the front of the thighs. The severe pain seldom lasts more than a few hours, but may return as the period draws near its close; in typical cases the patient is quite free from pain in the intervals between the menstrual periods.

Spasmodic dysmenorrhœa is especially apt to occur in imperfectly developed uteri; but in most cases the uterus, on physical examination, feels normal in size, shape, and position. The size and shape of the os externum seem to have no bearing on the condition.

Severe spasmodic dysmenorrhœa of congenital origin is by no means easy to deal with. The pain may sometimes be relieved by drugs, but their action is uncertain. Some cases are cured by dilatation of the cervix, others only relieved, whilst not infrequently the operation fails entirely; in refractory cases of exceptional severity, hysterectomy is the last resort.

If the patient be otherwise healthy, perhaps the treatment that most often gives relief is the administration of salicylate of soda in 10-gr. doses, three times a day after meals, for a week preceding each menstrual period, and at the onset of the pain phenazone (antipyrin) or phenacetin in 15-gr. doses every hour until three doses have been taken; with the onset of the pain the salicylate of soda is discontinued. In some cases antipyrin acts like a charm, if it can be given in sufficient doses *before* the expected onset of the pain. To this end, advantage is taken of the fact that patients are very often able, by premonitory sensations, to anticipate the onset of the pain by three or four hours; the antipyrin should be given in 10-gr. doses every hour until three doses have been taken, and then every two hours for three more doses. Many other drugs have been recommended, and occasionally do some good, such as atropine, cannabis indica, cannabin tannate, guaiacum resin, etc. Atropine has come into special prominence of late, and is best administered as tablets of atropine sulphate gr. $\frac{1}{150}$; if possible, two tablets at an interval of two hours should be given just before the severe pain is anticipated, and two more doses may follow. Bromides are of very little use, and opium should scarcely ever be prescribed. Care should be taken that the bowels are freely relieved at the time when the onset of the pain is expected, and if the patient is at all anæmic, iron (best given in large doses of ferrum redactum), taken a week before each period, is sometimes very effective.

Pain of the spasmodic variety occasionally develops in women who have previously suffered little or nothing, as the result of anæmia or overwork. In such cases rest and a course of iron usually soon set matters right.

If the pain is really severe, and is not relieved by drug treatment, the patient should be recommended to have the operation of dilatation of the cervix. It is important to remember that this does not cure all cases of spasmodic dysmenorrhœa, and it is generally impossible to foretell the result in any individual case. Graduated metal dilators are used, and an anæsthetic and careful antiseptic precautions are of course necessary. The cervix should be dilated to a size corresponding to No. 14 on Hegar's scale. When the dilatation is completed, it is generally wise to curette the uterus, especially in cases of long standing. It is unwise to pack the uterus, and unnecessary to pack the vagina. Cases which dilatation of the cervix with curetting fails to cure or relieve, are generally best advised to put up with their troubles, with the help of drugs. If, on account of the intensity of the pain, further operative treatment is called for in a young woman, the uterus may be removed by hysterectomy. This operation must be looked on as a last resort, and should not be undertaken unless the symptoms are unusually severe and all other methods have failed to give relief.

2. **Congestive Dysmenorrhœa.**—In this variety the pain is a continuous pelvic ache, and begins a week or more before the onset of the period, and is usually relieved as soon as a free flow is established. It is always associated with pelvic disease, and is dependent on the accompanying pre-menstrual pelvic congestion; states commonly associated with it are fibromyoma of the uterus, fixed retroflexion of the uterus, and tubo-ovarian inflammation. The treatment of the pain, which is merely a symptom, consists in removing the cause. *Eardley Holland.*

DYSPAREUNIA.—The cause of the pain may be vulval, vaginal, or more deeply situated.

Vulval Causes.—Inspection of the vulva may reveal a tender spot, painful red patch, inflamed tag of hymen or hymeneal fissure, vascular caruncle, etc., or the orifice may be too small. For the first four conditions, abstention from sexual intercourse, and application of lead lotion and a soothing dusting powder, such as dermatol, will be sufficient. A vascular caruncle should, of course, be removed. For cases in which the vaginal orifice is too small, *vide* VAGINISMUS.

Vaginal Causes.—An acute or subacute vaginitis may be found, for which rest, and soothing douches of lead or boracic acid, should be ordered. A vaginal cyst, if causing dyspareunia, should be removed.

More-deeply-situated Causes.—Retroversion with tenderness of the body of the uterus, low position of tender ovaries, or inflammation of the tubes and ovaries, may be the cause of severe dyspareunia. For the treatment of these conditions, *vide* the articles on the treatment of retroversion (UTERUS) and of SALPINGO-OÖPHORITIS.

In some cases *Tenderness of the Urethra* is the cause of the pain. Hyoscyamus may be given internally, and bougies made up with 5 gr. of dermatol in cacao-butter may be inserted into the urethra two or three times a week.

In cases of spasmodic dysmenorrhœa, dyspareunia is common. Dilatation of the cervix is sometimes successful by itself in removing this trouble; in other cases the vaginal orifice is too narrow.

Incomplete intercourse seems to be responsible for some cases of aching in the pelvic organs and dyspareunia. If no cause can be found, a cacao-butter pessary containing cocaine may be tried. (*See also* STERILITY.) *H. Russell Andrews.*

DYSPEPSIA.—The treatment of the different varieties of dyspepsia is considered in detail in various articles, but it is proposed to discuss here some general principles applicable to all cases.

At the outset it must be clearly realized that treatment is not likely to be satisfactory unless some attempt be made to ascertain the precise form of stomach derangement with which one has to deal. Failure to attain success is usually due to neglect of this rule. It will be necessary, therefore, to make a few preliminary observations on the subject of differential diagnosis.

In the first place, it must be remembered that in many patients who complain of 'indigestion', the seat of the trouble is not really in the stomach at all.

Any of the three leading symptoms of dyspepsia—vomiting, pain, and flatulence—may be misinterpreted by the patient (and his doctor) and be supposed to indicate a primary disorder of the stomach, when in reality the real seat of the disease is somewhere else. It will be sufficient to enumerate some of the chief causes of these symptoms which are liable to be thus misinterpreted.

1. *Vomiting.*—The chief sources of fallacy here are (*a*) Pregnancy, (*b*) Uræmia, (*c*) Chronic intestinal obstruction, (*d*) Disease of the nervous system, *e.g.*, cerebral tumour, incipient meningitis, the gastric crises of tabes, hysterical or nervous vomiting, and migraine, (*e*) Phthisis. In all of these conditions gastric symptoms, and especially vomiting, may so predominate as to lead to an erroneous diagnosis of dyspepsia.

2. *Pain.*—The pain of gastric disease may be simulated by that due to (*a*) Gall-stones, (*b*) Chronic appendicitis, (*c*) Mucous colitis, (*d*) Angina pectoris and 'abdominal' angina, (*e*) Pleurisy, (*f*) Spinal caries, (*g*) Abdominal aneurysm.

3. *Flatulence.*—The commonest error in this connection is the mistaking of 'eructatio nervosa' for flatulent dyspepsia; but flatulence may also be a prominent symptom in cholelithiasis, emphysema, cardiac disease, and angina pectoris, in all of which its significance is easily misinterpreted.

If the possibility of mistake in any of the above directions is present to the mind, it can usually be avoided without much difficulty, but it is important to exclude such conditions at the outset, and to make sure that the symptoms of which the patient complains are really due to some primary disease or disorder of the stomach. Assuming that this has been done, one has next to inquire: Are the symptoms due to organic or to functional disease?

The distinction of organic from functional conditions is sometimes very easy, but at others extremely difficult. In certain cases, indeed, it is only by the process of exclusion, or by watching the results of treatment, that one can feel sure he is dealing with a purely functional disorder. Generally speaking, however, the following symptoms point to organic trouble: (1) Persistent vomiting, (2) Severe pain, (3) Marked interference with the general health; whereas, conversely, the absence of these is in favour of a functional disorder.

1. Wherever vomiting is a prominent feature in the history, the probability is great that one is dealing with organic disease, for functional disorders either do not produce vomiting at all, or it only occurs as an occasional and inconspicuous feature in their course.

2. Pain, if really severe, is also strongly indicative of organic disease, especially of ulcer. The difficulty here is that patients describe pain so inaccurately, and what is to one a mere ache or discomfort, is spoken of by another as if it were really acute. Usually, however, if the pain be of such severity that the patient has to give up work, lie down, and apply heat to the abdomen, organic disease is present.

3. Decided loss of flesh and strength are also strongly in favour of organic disease, for functional disorders, even when they are of some standing, do not produce these effects, or only do so very gradually.

The chief *organic affections* of the stomach are carcinoma, ulcer, organic dilatation, and gastritis. It would be going too far to consider here the differential diagnosis of these; but having decided which is present, the treatment will be found under the appropriate heading. (*See* Stomach, Carcinoma of; Gastric Ulcer, etc.)

If one decides that the case is functional, as the vast majority of cases of dyspepsia are, one has next to determine, before beginning treatment, what particular variety of functional disorder the patient exhibits. Three forms of classification may be adopted: (1) Physiological, (2) Clinical, (3) Etiological.

1. *Physiological.*—In this classification, cases of functional dyspepsia are arranged according to the particular function or functions affected, thus:—

a. Affections of secretion: (i) excess = hypersecretion and hyperchlorhydria; (ii) defect = achylia and hypochlorhydria.

b. Affections of motility: (i) excess = ? pyloric spasm; (ii) defect = atony or impaired motility.

c. Affections of sensation: Excess = hyperæsthesia or gastralgia.

Any of these may be present alone, or two or more may exist in conjunction.

The above is undoubtedly the most scientific method of making a differential diagnosis in cases of functional dyspepsia, but it has the inconvenience of necessitating the use of test meals.

2. *Clinically* cases may be classified, according to the chief symptoms they exhibit, into various ill-defined groups, e.g., atonic, acid, flatulent, nervous, etc.

3. *Etiological.*—Instead of attempting to distinguish between different forms of functional dyspepsia, one may regard it as an aggregation of symptoms of gastric disorder, excited by different causes, and classify cases according to the particular exciting cause at work. This method is simple and convenient, and is also useful for purposes of treatment. Adopting it, one may say that functional dyspepsia may be induced by; (*a*) Dietetic causes, e.g., unsuitable food, hasty meals, the abuse of alcohol, tea, etc.; (*b*) Physical causes, e.g., imperfect chewing, defective teeth, oral sepsis, constipation, over-fatigue, deficient exercise, etc.; (*c*) Mental causes, e.g., overwork, a studious life, etc.; (*d*) Emotional causes, e.g., shock, worry, etc.

Any one of the above ways of looking at the subject is useful, the essential point being that a classification of some sort should be adopted. Probably a combination of the first and third methods, which takes into account both the particular disorder which is present and the cause which has brought it about, will lead to the best treatment.

The general principles to be observed, therefore, in the treatment of a case of functional dyspepsia are : (1) To attack the cause, if it can be discovered ; (2) To adapt the diet to the impaired functional power of the stomach ; (3) To administer such drugs as are calculated to stimulate or correct the particular function or functions which happen to be impaired or disordered.

1. When the *cause* of the dyspepsia is dietetic or physical, its removal is usually easy, and involves such measures as correction of errors in eating and drinking, attention to the hygiene of the mouth and to thorough mastication, the removal of constipation, and the institution of improved general hygiene. The following rules should therefore be impressed upon the patient :—

a. Fresh air is important for dyspeptics. Stuffy and crowded places should be avoided.

b. An effort should be made to obtain regular exercise, preferably in the open air. Riding is the best exercise when obtainable, but brisk walking is better than nothing. Bicycling is not to be recommended. Of indoor exercises, fencing and skipping are the best. Loud reading in a standing position is also of great service.

c. A cold or tepid sponge-bath should be taken in the morning, and a warm bath at least once a week. The bath should be followed by a good rub down with a rough towel.

d. Chill frequently aggravates dyspepsia. A flannel (Jaeger) abdominal belt should therefore be always worn, especially in the winter and spring months.

e. Anything which may cause pressure on the stomach should be avoided, such as tight clothing. Cramped postures are also very harmful, such as stooping over a desk or table. If the occupation entails much writing or reading, the posture should be varied from time to time by standing at a high desk.

f. Attention to the teeth is of the greatest importance, and if they are in any way defective, a dentist should be consulted immediately.

g. Rules of diet should be strictly adhered to. Meals should be eaten in company, and taken at regular intervals. Reading during meals must be avoided. Each meal should be preceded and followed by half an hour's rest, either sitting or reclining.

h. The food should be chewed *very* thoroughly, until each mouthful is reduced to a creamy consistence, before being swallowed.

i. Smoking is best avoided altogether. It is least harmful if indulged in about half an hour after food.

j. Attention to regular action of the bowels is of the first importance, but the use of drastic aperients should be avoided.

If the underlying cause of the dyspepsia is, as often happens, a mental or emotional one, its removal is a much more difficult matter, and may, indeed, be impossible. As most of such patients, however, are neurasthenics, and the dyspepsia is simply a consequence of the nervous state, the article NEURASTHENIA should be consulted for hints as to their management.

2. In the *dietetic treatment* it is important to individualize, and to adapt the diet not only to the patient with due consideration of his likes, dislikes, and idiosyncrasies, but also to the particular disorder of function. Thus, in cases of atonic dyspepsia one has to restrict fluids and the use of bulky, innutritious articles of food ; in 'acid' cases one has to limit the carbohydrates, and so on. Detailed instructions will be found under the headings devoted to the special forms. In all cases, however, it is important to remember that the following are the most 'digestible' articles of food (i.e., those which make least demand upon the secretory and motor powers of the stomach) :—

Meats : Mutton, venison, sweetbreads, chicken, tripe, rabbit, grouse, partridge, pheasant.

Fish : Whiting, sole, turbot.

Farinaceous foods : Stale white bread, rusks, plain biscuits, rice, tapioca, sago, arrowroot.

Vegetables : Asparagus, seakale, spinach, cauliflower, French beans.

Fruits : Baked apples, the juice of oranges or grapes.

'Made dishes', twice-cooked meats, sauces, pastry, pickles, cheese, sweets, and preserves should be avoided altogether. Meat should be underdone ; fish should be boiled or steamed.

In cases of 'nervous' dyspepsia (i.e., those in which all the stomach functions are found upon investigation to be normal), and gastroptosis, and in many cases of the 'atonic' variety, however—in a word in all dyspepsias associated with a neurasthenic state—it is often necessary to throw dietetic rules to the winds and to feed the patient up, it may be even by means of a Weir-Mitchell course. (*See* NEURASTHENIA.)

3. In the selection of *drugs* in the treatment of dyspepsia, it is important to avoid all routine and rule-of-thumb procedure, and to compile one's prescription with an eye to the special disorder or disorders of function, whether secretory, motor, or sensory, believed to be present. There is no lack of medicinal agents from which to make a choice, thus :—

a. If *secretion be in excess*, one may give belladonna, bromides, or bismuth before meals in order to lessen it, or earthy carbonates some time after meals to neutralize it. (*See* HYPERCHLORHYDRIA.)

b. If *secretion be defective*, one can give bitters before meals to stimulate it, or hydrochloric acid or acidol, with or without pepsin, after meals, to supplement or replace it. (*See* ACHYLIA.)

c. If *motility be defective*, strychnine, bitters, physostigmine, and alcohol are useful as muscle-stimulants, and carminatives may be employed to expel flatus. (*See* DYSPEPSIA, ATONIC ; AND GASTROPTOSIS.)

d. If *hyperæsthesia be present*, there is a large class of sedatives to choose from, e.g., bismuth, bromides, opium, chloroform, hydrocyanic acid, cannabis indica, etc. (*See* GASTRALGIA.)

The following are some typical prescriptions illustrating the use of drugs in different disorders of function :—

FOR HYPERSECRETION (HYPERCHLORHYDRIA, ACID DYSPEPSIA, ETC.).

℞ Sodii Bromidi gr. x | Aquæ Chloroformi ℥ss
Bismuthi Carbonatis gr. xv |
Before meals.

℞ Sodii Bicarbonatis | Magnesii Carbonatis Ponderosi āā
Bismuthi Bicarbonatis |
A small teaspoonful in a little water or milk about two hours after meals.

FOR DEFICIENT SECRETION (HYPOCHYLIA, ACHYLIA, GASTRITIS, ETC).

℞ Sodii Bicarbonatis gr. x | Spiritus Chloroformi ♏x
Tincturæ Nucis Vomicæ ♏iv | Infusum Gentianæ Compositum ad ℥ss
Before meals.

℞ Acidi Hydrochlorici Diluti | Aquam ad ℥ss
Glycerini āā ♏xv |
About twenty minutes after meals.

℞ Glycerini Pepsini ℥j
To be taken with the above mixture.

FOR DEFECTIVE MOTILITY (ATONIC DYSPEPSIA, GASTROPTOSIS, ETC.).

℞ Tincturæ Nucis Vomicæ ♏v | Infusum Quassiæ ad ℥ss
Tincturæ Cardamomi Compositæ ℥ss |
Before each meal.

℞ Mentholis gr. ¼ | Spiritus Chloroformi āā ℥j
Spiritus Ammoniæ Compositi |
A teaspoonful as required for flatulence.

FOR HYPERÆSTHESIA (GASTRALGIA).

℞ Bismuthi Carbonatis | Tincturæ [Chloroformi et Morphinæ ♏v–x
Sodii Bicarbonatis āā gr. xv | Aquam Chloroformi ad ℥ss
In a little water before food.

For Defective Motility combined with Hypersecretion or Hyperæsthesia.

℞ Bismuthi Carbonatis		Tincturæ Nucis Vomicæ	℥ iv
Sodii Bromidi	āā gr. x	Syrupi Zingiberis	ʒ ss
Acidi Hydrocyanici Diluti	℥ iij	Aquam Menthæ Piperitæ	ad ʒ ss

Before each meal.

In addition to the use of drugs, such remedial agents as massage, electricity, and hydrotherapy are of use in some cases, but the indications for these are pointed out in special articles. *Robert Hutchison.*

DYSPEPSIA, ACID.—This term is loosely used to cover any disorder of the stomach in which the patient complains of a feeling of 'acidity', acid eructations, or heartburn. In some cases there may be a gastric ulcer present, in others an acid gastritis or hyperchlorhydria, whilst in some it is a pure neurosis (*see* Flatulence). It is therefore important to make an accurate diagnosis of the cause of the symptoms if possible before beginning treatment. Merely symptomatic treatment should proceed on the lines described in the article on Hyperchlorhydria. *Robert Hutchison.*

DYSPEPSIA, ANACID.—(*See* Achylia.)

DYSPEPSIA, ATONIC.—(*See* Stomach, Dilatation of (Atonic); Flatulence (Gastric); Gastroptosis.)

DYSPEPSIA IN CHILDHOOD.—Disorders of digestion in infancy are considered under the headings of Colic, Vomiting, and Diarrhœa, but in this article one has to deal with the characteristic digestive disorder of later childhood. The chief symptoms of this affection are: wasting, capricious appetite, flatulence, constipation, and vague abdominal pains; and it is frequently complicated by the presence of adenoids and by functional disorders of the nervous system, such as headaches, night terrors, and enuresis. Such cases are apt to be misunderstood, and the patients are often believed (erroneously) to be suffering from tuberculosis, but the symptoms are probably really due to a catarrhal condition of the alimentary canal. They were described by the late Dr. Eustace Smith under the title 'mucous disease', from the fact that mucus is often passed in considerable quantities with the motions.

The usual mistake made in the treatment of these patients is to attempt to 'feed them up' by giving milk freely and by administering cod-liver oil and iron (usually in the form of 'chemical food'). What they really need is (1) Regulation of the diet; (2) Change of air; and (3) The use of alkaline bitter tonics and (4) Aperients.

1. The most important part of the *dietetic treatment* is to reduce the amount of starches and sugar in the food. The following articles should be avoided: ordinary bread, porridge, farinaceous puddings, sweets, jams, raw fruit, vegetables (except a little cauliflower, spinach, or *mashed* potato), and pastry; and the diet should consist of stale white bread or crisp toast, rusks, malted foods, jellies, custards, a little stewed fruit, baked apple or fruit-juice, lightly cooked eggs, and underdone meats. Milk is not usually well borne, and not more than a pint should be given per day; it is best diluted with water or lime-water; cocoatina may be substituted at breakfast or tea. No food should be given between the regular meals.

2. *Change of air* is of the greatest help, especially when the appetite is poor. The seaside suits some children very well, the east coast being best in summer and the south coast in winter; but others do better at hilly inland resorts. It is often advisable to send dyspeptic children away for a short change three or four times a year, if it can be managed.

3. As regards *drugs*, alkaline bitter tonics usually give good results (e.g., sodium bicarbonate 3 to 5 gr., tincture nux vomica 1 to 3 min., spirit of chloroform 7 min., compound infusion of gentian 1 to 2 drachms, before each meal). If the tongue be furred and the breath offensive, a mixture of rhubarb and soda may be given for a week or two at first (e.g., rhubarb powder 1 gr., sodium bicarbonate 3 gr., tincture of nux vomica 2 min., syrup of ginger 10 min., peppermint water to 2 drachms, after each meal for a child of five). When the tongue has become clean, iron may sometimes be given with advantage, but it is usually best to combine it with an aperient (e.g., 1 drachm each of iron

wine and compound decoction of aloes; or sulphate of iron ½ to 1 gr., magnesium sulphate 5 to 10 gr., dilute sulphuric acid 1 to 2 min., syrup of ginger 3 to 5 min., add peppermint water 1 to 2 drachms, after each meal). A teaspoonful of a good malt extract may be given after meals, both as a digestive and as a food.

4. *Aperients* are necessary in the great majority of cases. Of these none is better than a combination of rhubarb and grey powder (rhubarb powder 3 to 5 gr. or more, with grey powder ½ to 1 gr.), but elixirs of cascara, senna, etc., are also useful. (*See* CONSTIPATION IN CHILDREN.)

In order to avoid relapses, attention should be given to general hygienic measures. Chill especially should be guarded against by suitable clothing, and excitement and overfatigue, whether mental or physical, avoided. It may therefore be necessary to curtail lessons and to see that more time is spent in the open air. A mid-day rest in bed or on a couch is often of help where the child shows signs of exhaustion. *Robert Hutchison.*

DYSPNŒA.—(*See* ASTHMA; BRONCHITIS; CROUP; HEART; ETC.)

EAR, AFFECTIONS OF.

I.—AURICLE.

Carcinoma demands early and wide removal of the affected parts and the neighbouring glands. The upper half of the auricle is the usual site. An artificial auricle can afterwards be worn. In inoperable cases radium should be used.

Cysts.—*Sebaceous* cysts, usually found in the lobule and back of the auricle, require dissecting out. Occasionally *serous* cysts form spontaneously in the upper and outer part between the perichondrium and the cartilage; these should be opened and drained. *Dermoid* cysts are occasionally found in front of or behind the auricle, and should be dissected out.

Eczema, Acute and Chronic.—

Acute Eczema yields to simple treatment. The parts should be kept covered with boracic acid or oxide of zinc ointment, smeared thinly on butter muslin carefully applied to the inequalities of the ear, and kept in position by absorbent wool and bandage. A 10 per cent watery solution of ichthyol gives good results. For cleaning, paroleine or oatmeal and water should replace soap. Recurrence is not uncommon, and attention must be paid to the general health.

Chronic Eczema.—The crusts should be removed with a greasy poultice or paroleine, and then either of the following applications should be applied three or four times a day:—

℞	Unguenti Hydrargyri Nitratis	ʒj	Paroleini	q.s. ad ℥j
℞	Liquoris Carbonis Detergentis	℥v	Zinci Oxidi	ʒj
	Hydrargyri Ammoniati	ʒss	Vaselini	q.s. ad ℥j

Painting the parts with nitrate of silver, 2 gr. to the ounce, is sometimes of great benefit.

The following application is often valuable:—

℞	Liquoris Plumbi Subacetatis	℥xv	Glycerini	ʒss
	Calaminæ	gr. xxv	Aquam Rosæ	ad ℥ij

The bottle to be well shaken before use.

To prevent scratching, it may be necessary to tie a child's hands or to cover them with lint. The general health will usually require attention. Arsenic internally is sometimes of value.

Erysipelas is occasionally associated with chronic eczema of the meatus. Ichthyol in water, 25 per cent, should be painted on the parts twice a day, with protection by means of absorbent wool and a bandage, together with the usual ordinary general treatment. Chronic eczema of the meatus, if present, should be treated to prevent recurrences.

Fibroma.—This tumour occurs in the lobule in connection with the holes made for the wearing of ear-rings. The tumour should be removed by means of a V-shaped incision, the opening of the V being at the edge of the lobule.

Frost-bite.—In recent cases the ear should be rubbed with snow or cold water until the circulation returns. Any ulcers which may subsequently form require boracic acid ointment.

Hæmatoma.—This is an effusion of blood, usually due to injury, between the perichondrium and the cartilage, and, if allowed to run its course, a shrunken, deformed auricle results. The blood should be evacuated by a free incision under antiseptic precautions, and a double cyanide gauze dressing, packed carefully into all the inequalities of the auricle, should be kept on with wool and bandage. The cleft between the auricle and the head should be filled with the gauze.

Herpes.—Boracic acid ointment, with absorbent wool and bandage, is all that is necessary. Herpes of the auricle may be associated with neuritis of the auditory and facial nerves.

Injury.—The auricle may be severely torn or cut. The parts should always be purified carefully and replaced in position with a few stitches, however impossible the chances of healing may appear, even if the whole organ has been removed.

Lupus is rarely primary in the auricle. The treatment is the same as in other parts of the body, but sometimes the disease in this position is more easily treated by excision.

Malformation.—Small fistulæ in front of the ear, leading towards the meatus, may be dissected out if they are the site of recurring inflammation.

If the auricle is rudimentary and no passage exists, operations undertaken with the view of forming an auricle or of making a meatus are contra-indicated. An artificial auricle should be worn, the rudimentary organ being used for its attachment. Supernumerary auricles can be dissected out.

If the auricle is very large, it can be reduced in size by a carefully planned operation; or if it projects in an unsightly manner, an elliptical portion of skin is removed from the back of the auricle and from over the mastoid process, and the edges of the resulting wound are brought together by stitches. It may be necessary to remove part of the cartilage.

Papilloma.—Occasionally ordinary warts are seen on the auricle, but do not demand special treatment. Single papillomatous growths should always be excised, especially in later life, as they may be the starting-point of epithelioma.

Perichondritis.—If the perichondrium becomes infected as a result of injury, operative or otherwise, the cartilage sloughs away and a shrunken auricle results. Free incisions should be made, and hot boracic fomentations constantly applied.

Syphilis.—The auricle is very rarely the site of a primary sore, but of course shares in the rashes in the later stage. Occasionally a tertiary ulcer is seen, and may be mistaken for carcinoma. Rarely, small tertiary ulcers are found on the edge of the auricle. Ordinary treatment always suffices.

II.—EXTERNAL AUDITORY MEATUS.

Aspergillus or Otomycosis.—This is only occasionally seen in England. Frequent re-accumulation of masses of epithelium with dark spots on it, associated with irritation and swelling of the meatal walls, should arouse suspicion. The microscope will put the diagnosis beyond doubt. In treating it, the object is to destroy the fungus. The meatus should be syringed with warm 1–500 perchloride of mercury night and morning for four days, and the meatus filled afterwards with hydrargyri perchloridum 1 gr., spt. vini rect. 1 oz., the head being placed on one side and the solution allowed to remain in for a quarter of an hour. If much inflammation of the parts is present, it should first be treated by hot boracic acid lotion syringing and hot fomentation.

Atresia.—If congenital, treatment is most unsatisfactory, unless it can be definitely determined that the middle and internal ears are healthy and the atresia is simply due to a mere partition of soft parts. The partition should be cut away and the passage kept open by means of leaden tubes until the raw surfaces have skinned over. It may be necessary, however, to turn the auricle forwards, remove the partition, and skin-graft.

Atresia may result from injury or inflammation, and the same treatment will be necessary.

Stenosis occurs as a result of chronic eczema, inflammation, injury, or bony growths. As long as a permanent opening, however small, remains, it will be found that it is sufficient for hearing, and nothing need be done after the local trouble is cured.

Carcinoma.—This may start in the cartilaginous part of the meatus after long-continued eczema, or at the site of a wart; or the passage may be secondarily involved

from neighbouring parts. Free removal and the application of radium are the methods of treatment. It will be found that even if complete removal is impossible, the treatment will relieve the intolerable pain.

Caries.—Death of part of the bony meatus may occur as the result of a localized abscess, but it is usually secondary to extension from the middle-ear tract.

If due to the former, free curetting and the removal of the diseased bone through the meatus will effect a cure. It may be necessary, however, to turn the auricle forward to obtain enough room.

Cerumen.—The mass will, as a rule, be easily removed by syringing. Before syringing the ear, an examination should be made to make sure that it is required. Great harm may be done by needless syringing.

The syringe should be of one-ounce capacity, with a projecting rim for the fingers, and should have a nozzle with a thin but smooth point. Care should be taken that the syringe is pure, either by immersion in and filling with carbolic solution 1–20, or by boiling. Not uncommonly one syringe is made to do duty for all ears, septic or not, without any purification, and occasionally great harm results. The water should be previously boiled and be used warm. A good guide is to have the water of such a temperature that it is pleasantly hot when applied to the back of the hand.

The patient should be seated opposite a window, with the light falling on the ear to be syringed. The auricle is then pulled—downwards in an infant, downwards and backwards in a child, and upwards and backwards in an adult—in order to straighten the passage.

The syringe having been filled, and all air having been expelled, the nozzle is placed just inside the meatus, and the water is projected along the posterior wall in a slightly jerky manner, the process being repeated until the mass is expelled.

The ear should then be emptied of water by turning the head on one side; and it should then be examined to make sure that the passage is clear, and a light plug of wool introduced and worn for a few hours.

If there is difficulty in removal, or if it is obviously very hard, the mass may be softened by filling the passage, while the head is placed on one side, with the following solution, used warm, and allowing it to stay in for a quarter of an hour three times a day :—

℞ Sodii Bicarbonatis gr. xv | Aquæ Destillatæ āā ℥j
Glycerini

Parolein or peroxide of hydrogen is also useful. When ordering the instillation, the patient should be warned that it may make the hearing temporarily worse.

If the passage is swollen and tender, hot fomentation, together with the instillation, should be used before syringing. Occasionally the passage is filled with layers of desquamated epithelium mixed with cerumen (*Keratosis obturans*), and the mass is often very difficult to remove, especially as the walls of the passage are usually very tender. Syringing after frequent softening may be efficacious, but it is often necessary to separate the mass gently from the wall at one point with a small silver loop, and then to seize the separated part with ear forceps and gently pull the whole mass out. In very nervous patients an anæsthetic may be necessary. After removal of the epithelial plugs an enlargement of the floor of the bony meatus is occasionally found. The ear should be examined and cleaned about once in two months, to prevent discomfort and deafness.

Diphtheria.—This is usually due to spread of the infection from the middle ear, but it may be purely local. The local treatment consists in syringing the ear four times a day with a saturated solution of toluol, the application of hot fomentation, and the usual serum injection.

Eczema localized to the meatus is very often due to the bad habit of picking the ear with the nail, or with the pernicious instruments sold for cleaning the ear. As the itching is often nearly intolerable, great self-control is necessary to abstain from scratching the parts. Brisk rubbing in front and behind the ear, well away from the meatus, with the first two fingers, will alleviate the extreme irritation. The passage should be gently painted two or three times a day with the following preparation :—

℞ Unguenti Hydrargyri Nitratis ℥j | Paroleini q.s. ad ℥j

A little being poured out, after shaking, on to the bottom of an inverted tumbler, is lightly applied with a camel's-hair brush, which should be thoroughly cleaned and dried after each application. The patient should be warned not to rub the parts with the hard part of the brush, as the temptation to do so is very great. If the meatus becomes occupied by offensive discharge, and there is thickening of the skin, perhydrol (vols. 10) instillations for five minutes, night and morning, followed by syringing with warm boiled water or sterile salt solution, and the subsequent application of the calamine lotion (*see* CHRONIC ECZEMA OF AURICLE), will be found of great value; the number of times the treatment is applied being gradually lessened as improvement takes place.

At night a broad ring pad may be worn round the ear, or the pillow may be curved round in such a way as to prevent rubbing. The secretion tends to collect in the meatus, and often becomes very offensive; syringing with boiled boracic acid lotion or sterile salt solution once or twice a day, before applying the mercurial application, is then necessary.

Should the passage become extremely contracted, a thin wick of wool soaked in the application should be worn all night, and gradually increased in thickness as the passage opens. General anti-gout treatment is useful, and also arsenic.

The eczema may be due to the irritation of a septic middle-ear discharge.

Endothelioma.—This rare tumour of the meatus requires thorough removal of the whole cartilaginous meatus, with subsequent skin-grafting to keep the passage open. Radium should also be used. As most of the pinna is left, the resulting deformity is slight.

Epithelial Plugs, or Keratosis Obturans.—(*See* CERUMEN, *supra*.)

Erysipelas.—Recurring attacks often begin in the meatus in cases of eczema. The disease is likely to spread beyond the auricle on to the head, but the deep meatus and the middle ear are rarely if ever affected. Ichthyol during the attack, and cure of the chronic eczema, are the lines of treatment.

Exostosis ahd Hyperostosis.— Bony growths in the meatus take three forms: (1) Multiple, sessile, ivory, in the deep meatus; (2) General thickening of the bony meatus, or hyperostosis; (3) Single pedunculated.

1. The *Multiple Growths* are usually three in number. They very rarely cause symptoms, but the chink between them is readily blocked with cerumen. They hardly ever require removal, but they may cause retention of pus in suppuration of the middle ear, and will then have to be dealt with. They may be removed through the meatus with a small trephine (Pritchard's), worked by a dental engine or electric motor, or the auricle may be turned forwards and the growths chiselled off.

2. *Hyperostosis* also very rarely requires surgical interference. The excess of bone may be removed through the meatus with a chisel and hammer, or by a burr worked by a motor.

3. The *Single Pedunculated* variety is rarely seen. It grows close to the orifice of the meatus, and may quite occlude the passage, causing deafness. The growths are easily broken off with dental stump forceps.

Foreign Bodies.—Unless the foreign body is a living insect, its presence in the meatus rarely causes much discomfort or danger. The danger lies in roughly attempting to remove it.

In all cases the presence of the foreign body must be ascertained by means of a good light reflected into the ear through a speculum from a head mirror. In children an anæsthetic will sometimes be necessary. If a living insect is present, the head should be placed on one side and the meatus filled with parolein or chloroform vapour; the insect will either come out of its own accord or will be killed, when it is easily removed by syringing.

Other foreign bodies should be *syringed* out, and unless the operator is skilled in aural work, nothing further should be attempted. Rough efforts at removal may result in rupture of the membrane, removal of the ossicles, facial paralysis, meningitis, or cerebral abscess. The syringing should be done under aseptic conditions (*see* CERUMEN, *supra*). If there is a chink between the foreign body and the meatal wall, the stream should be directed through it. If the foreign body is heavy, the ear may be turned downwards and the syringing done from below.

If the meatus is swollen external to the foreign body, removal should not be attempted —unless symptoms indicating urgency are present—until the inflammation has been

reduced by hot fomentation. If syringing is not efficacious, instrumental removal will be necessary under strict antiseptic precautions. The meatus and auricle should be purified—the meatus by instillation for twenty minutes of 1–20 carbolic acid solution and subsequent syringing with 1–2000 solution of perchloride of mercury. The auricle is purified in the ordinary way, and all instruments should be boiled and placed in 1–20 carbolic acid. The parts, if they are dry, may be rapidly purified by the application of iodine in alcohol, 2½ per cent. There is sometimes great scope for ingenuity in removing a foreign body.

If removal through the meatus is impossible, more room can be obtained by turning the auricle forward and removing enough of the posterior and superior walls of the bony meatus with a chisel and hammer.

If dangerous symptoms are present, it will be necessary to lay the middle-ear tract thoroughly open, and to deal with any intracranial trouble which may have resulted.

Furunculosis or Boil.—These are always situated in the cartilaginous meatus, and the quickest way of dealing with them is to make a free and deep incision through the inflamed tissues, under gas anæsthesia, with a narrow, probe-pointed knife. Even if pus has not yet formed, the relief will be great. After the incision, hot fomentation and frequent syringing with hot 1–2000 solution of perchloride of mercury are necessary. If incision is impossible or refused, a poultice, followed by hot fomentation, should be applied until the boil bursts. Morphia may be necessary to relieve the pain and to procure sleep. Recurrence is often seen, and to prevent this it is necessary thoroughly to purify the cartilaginous portion of the meatus after the inflammation has subsided. This should be done by instillation of 1–20 carbolic acid for twenty minutes, followed by a light gauze plug soaking with 1–2000 perchloride of mercury, every day for three days. The general health will require attention. If recurrence takes place in spite of thorough purification and attention to the general health, vaccine treatment will be found valuable.

Boils are sometimes associated with chronic eczema and with suppuration of the middle ear.

Herpes.—Herpetic eruptions may occur in the meatus or on the membrana tympani. If on the membrane, it is important not to mistake the condition for acute middle-ear inflammation. Hot fomentations and morphia internally will relieve the pain before the vesicles have burst; after rupture has occurred, boracic acid powder should be insufflated. General tonic treatment and rest from worry are indicated. Herpes of the auricle and neck is sometimes associated with facial paralysis, giddiness, and internal-ear deafness. Recovery usually takes place with rest and counter-irritation. It is well, however, to have a Wassermann test made.

General or Diffuse Inflammation.—Any cause, such as discharge from the middle ear, aspergillus, or cerumen, should be removed. Hot fomentations and hot boiled boracic syringing should be used, and any granulations which form should be lightly touched with solid nitrate of silver fused on the end of a silver probe.

Papilloma.—Single papillomatous growths should always be widely removed, as they may be the starting-point of epithelioma.

Polypi.—As a rule polypi in the meatus are merely exuberant granulation tissue coming from a septic middle-ear tract. Their treatment is described under middle-ear suppuration. When they occur as a result of inflammation of the soft tissue of the meatus, they should be lightly touched with nitrate of silver, and the ear syringed with boiled boracic lotion or 1–4000 perchloride of mercury night and morning. If the bone is carious, the parts should be thoroughly curetted under an anæsthetic. Carcinoma and sarcoma appear as a polypus or a mass of granulations; the very free bleeding and the extreme pain produced by gentle manipulation with a probe will arouse suspicion.

Sarcoma is rare as a primary growth of the meatus, which is more often invaded from a tumour in neighbouring parts. Free removal after turning the auricle forward, and the application of radium, are the methods of treatment.

III.—MIDDLE EAR.

Carcinoma.—Treatment is palliative—a complete removal is impossible. Free opening of the middle ear, antrum, and mastoid process, with removal of as much of the disease as is possible, is often of value in relieving pain. Radium should be used.

Catarrh, Acute and Chronic.—Cararrh of the middle ear results from a catarrh of the nasopharynx spreading up the Eustachian tube.

Acute Catarrh.—In the acute stages, rest, purging, light diet, with complete abstinence from tobacco and alcohol, with hot inhalation of benzoin four times a day for five minutes, and gentle inflation with Politzer's bag twice a day, are all that is necessary. In the subacute stage, chloride of ammonium vapour produced by Rogers' inhaler is valuable. The vapour is drawn into the mouth from the mouthpiece, and then blown through the nose, for ten minutes night and morning, and twice at each sitting the vapour should be introduced into the middle-ear tract by blowing down the tightly closed nose when the mouth and nose are full of the vapour. If it is desired to inflate one ear more than the other, the patient should place the head on one side, with the affected ear uppermost and the other ear blocked with the finger. A warm sterile astringent and alkaline nasal solution, or glycothymoline solution, should be poured into the nose after the inhaler has been used. Politzer's bag (*see* EUSTACHIAN OBSTRUCTION, *infra*) will be required once a day, with increasing intervals as the hearing improves. If the blockage is very great, the Eustachian catheter (*see* EUSTACHIAN OBSTRUCTION) may be necessary after the acute stage is over. Injection through the catheter of 10 drops of warm parolein, or a warm sterile solution of potassium iodide 10 gr. to the ounce, or sodium bicarbonate 5 gr. to the ounce, is sometimes of value, especially if the catarrhal fluid is very sticky in character.

Change of air, especially to the seaside, is of the greatest value. Tonics should also be given. In very obstinate cases it is sometimes necessary to evacuate the contents of the middle-ear tract by making an incision in the posterior and inferior segments of the membrane, and subsequently removing the catarrhal fluid by means of Politzer's bag, or by sucking it out with Siegle's exhausting speculum, or both methods may be employed.

Any unhealthy condition of the nose and nasopharynx will often require dealing with before a complete cure is obtained, and also to prevent recurrences. Adenoids will often be found.

Chronic Catarrh.—If the condition has become chronic, the nose, nasopharynx, and throat should be thoroughly examined and made in as healthy a condition as possible; the tube should be kept open by regular inflation with Politzer's bag or the Eustachian catheter; the membrane and ossicles be kept supple by gentle massage with Delstanche's masseur for one minute night and morning, and chloride of ammonium vapour used off and on in the manner previously described.

A high and dry climate will be beneficial, and the diet should be light, with only one meat meal a day; plenty of fluid should be taken. Alcohol and tobacco should be absolutely stopped. The whole body should be rubbed briskly with a rough towel night and morning, and a Turkish bath may be taken once a month. Occasionally the hearing in these cases is improved by making a hole in the membrane. If the patient states that he hears better in a noise, treatment will be of little value.

Eustachian Obstruction.—The cause in the nasopharynx should be searched for and treated. It may be due to catarrh, often associated with adenoids, new growth, or cicatricial contraction.

The tube should be opened and kept patent by various methods, and the one employed will depend on the cause and persistency of the obstruction. After the subsidence of acute inflammation at the mouth of the tube, or the removal of a new growth from the nasopharynx, the mere act of swallowing will often do all that is necessary. If the closure persists, Valsalva's method of auto-inflation may be efficacious. The nose is tightly held while the patient blows strongly down it and at the same time makes an effort at swallowing. Inflation with Politzer's bag is often necessary, and may have to be repeated daily until the hearing returns. An eight-ounce bag, to the nozzle of which a nosepiece (Pritchard's) is connected by means of a short piece of rubber tubing, is the best. The patient having taken a sip of water, the end of the nosepiece is placed just inside the nose, past the vestibule, which is higher than the floor of the nose, with the opening pointing down the inferior meatus; the nostrils are then closed round the nosepiece with the finger and thumb of the left hand, and the patient is directed to swallow. When the larynx is seen to move upwards—and it is a good plan to place the patient's head sideways to the surgeon in order to see this—the bag is sharply squeezed with the right hand, taking care that the bag is not jerked upwards, for if it is the tube becomes

kinked and no air passes. The grasp of the bag should not be relaxed until the nosepiece has been withdrawn and cleaned, for if the bag is allowed to expand with the nozzle in the nose, mucus is sucked in. On efficient inflation the patient will experience an explosion in the ear, and the hearing will at once be greatly improved. The surgeon can hear the air enter the middle ear if an auscultation tube connecting the patient's ear with that of the surgeon is used. Instead of swallowing water, the soft palate may be made to shut off the nasopharynx from the pharynx by blowing out the cheeks or by saying 'hic'.

If there is difficulty in opening the tubes with the bag, a few drops of chloroform may be poured into the bag and allowed to evaporate before inflation.

If it is desired to inflate one ear only, the head should be placed on one side, with the affected ear uppermost and the other blocked with the finger. The nosepiece of the bag should be carefully purified after each patient.

For Eustachian catheterization, a medium-sized short silver catheter, with a ring on the butt corresponding to the point, is the best. Before use it should be boiled, and air should be blown through, to make sure that the instrument is clean and clear. The nose should be examined for anything, such as deviation of spurs from the septum, likely to prevent or hinder the passage of the instrument. If it is impossible to pass the catheter down one side of the nose, both ears may be catheterized through the clear one, a right-angle bend being made in the instrument to reach the tube on the obstructed side. At the first sitting, or if the patient is nervous, a 2 per cent solution of cocaine should be previously sprayed along the inferior meatus. The surgeon, seated opposite the patient, first places the ends of the auscultation tube in his own and the patient's ear. With the last three fingers of the left hand resting on the bridge of the nose, the tip of the nose is tilted up with the left thumb, and the point of the catheter is introduced into the lower part of the nostril, with its opening pointing backwards and the bend forwards. After it is passed through the vestibule, which is higher than the floor of the nose, the surgeon's end of the instrument is raised so that the main part is horizontal and the point rests on the floor of the nose. The instrument is then gently passed straight backwards, being rotated round any obstruction from the septum, until the posterior nasopharyngeal wall is reached. The feeling closely resembles that experienced on pressing the point of the catheter against the palm of the hand.

At this point the ring on the catheter will point downwards ; it is then turned inwards and upwards, so that the ring points horizontally away from the ear to be catheterized ; the catheter is gently pulled forwards until the posterior edge of the septum is felt, when the point is rotated downwards, outwards, and upwards, until the ring points to the outer canthus of the eye and the point is lodged in the mouth of the tube. The catheter is fixed in this position by the thumb and first finger of the left hand, and the nozzle of the inflating bag fitted into it. On inflation, the air can be heard to pass through the Eustachian tube and reach the middle ear ; if catarrhal fluid is present in the tube or middle ear, bubbling will be heard. The blowing should continue until about six clear inflations have been heard ; it may, however, take several sittings before the air can be heard clearly to enter the middle ear.

If it is desired to introduce fluid into the middle ear, the catheter is passed, and inflation made to ascertain that the instrument is in the mouth of the tube ; the inflating bag is then detached, and by means of a pipette or syringe the warmed solution is injected into the catheter and blown into the middle ear with the inflating bag. Vapours may also be introduced either by a special apparatus or by filling the inflating bag.

Foreign Bodies.—These are not common in the middle ear. In most instances they have been pushed through the membrane by rough attempts made to remove them from the meatus. They demand prompt removal. If aseptic syringing is not successful, the foreign body will have to be removed instrumentally through the meatus under an anæsthetic and with strict antiseptic precautions. It may be necessary to enlarge the opening in the membrane, or even to turn the ear forwards and to chisel away the posterior and superior bony meatal walls to give more room. If sufficient room is not then obtained, the middle-ear tract must be thoroughly opened, as in the complete post-aural operation ; in fact, sepsis may compel the surgeon to adopt this radical measure.

Inflammation, Acute and Chronic.—

Acute Inflammation.—In the early stages, when there are merely injection of the malleal vessels and general redness without bulging of the membrane, the inflammation can sometimes be cut short.

The first thing is to put the patient to bed, purify the meatus by instillation of warm 1–20 carbolic for a quarter of an hour, and introduce a light plug of double cyanide gauze wrung out in 1–2000 perchloride of mercury; the auricle, also filled and covered with the gauze, is kept in position by wool and bandage.

Purification and plugging serve several purposes: functional rest is obtained; the parts are ready if an incision has to be made in the membrane; and if an abscess rapidly forms and bursts through the membrane, it does so into an antiseptic dressing. Hot fomentations are applied over the ear without disturbing the gauze. Blistering or counter-irritation over the mastoid should not be used, for their effects may subsequently mask mastoid signs. As the inflammation has spread up the tube from the nasopharynx in the great majority of cases, warm benzoin inhalation through the mouth and nose every two hours should be ordered. A gentle inflation with Politzer's bag will open the tube and relieve the pain. Morphia should be given if the pain is great and preventing sleep. If the pain is not relieved in six or eight hours, it will mean that the inflammation is not cut short, and that it will be necessary to open the membrane. On looking at the ear it will be found that the redness has increased, and that there is bulging of the membrane,

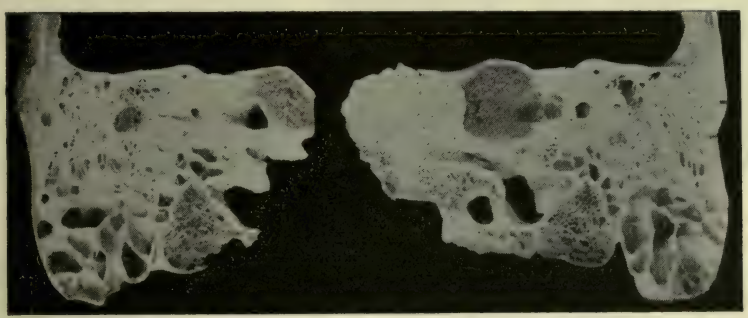


Fig. 24.—Right Temporal Bone of a male, age 18 years, sectioned to show mastoid cells well developed.

usually in the posterior segment. Under gas anæsthesia the membrane is opened by means of a fine sharp-pointed knife. The incision should start from behind the short process of the malleus, and pass right down through the posterior segment of the membrane. If the bulging is in Shrapnell's membrane it should be included in the incision. The bleeding will be fairly free. The blood and evacuated material should then be gently wiped out with gauze mops, a light plug again introduced, and the outside dressing and fomentation reapplied. The contents of the middle ear may be serous or mucopurulent. The relief to the patient will soon be obvious. The dressings should be changed about every six hours, the frequency depending on the amount of discharge. It may be found that the discharge is quite slight, and rapidly ceases without any syringing, or it may become very profuse, necessitating frequent dressing and the clearing of the meatus by gentle syringing with warm boiled boracic lotion or sterile salt solution; in these circumstances it is wise to omit the meatal gauze, and have an outer dressing only. Strong antiseptic solutions should be avoided.

When the pain is gone, the fomentation should be left off and a daily gentle inflation made with Politzer's bag. As the discharge lessens, the interval between the dressings is gradually lengthened.

After the attack is over, and the patient has regained his health by change of air and tonics, search should be made for any predisposing cause, especially for adenoids. During the attack the patient should be carefully watched for any sign of extension to the antrum or mastoid process, and for labyrinthine and intracranial complications.

In young children, before the mastoid cells have formed, pus in the antrum, which

is part of the middle ear, will perforate high up behind the ear. In dealing with such a case the ear is turned forwards, and only the outer wall of the antrum need be removed to secure good drainage. The middle ear proper should not be touched. The wound being lightly plugged will heal up from the bottom; the discharge from the meatus will quickly subside, and perfect hearing will result.

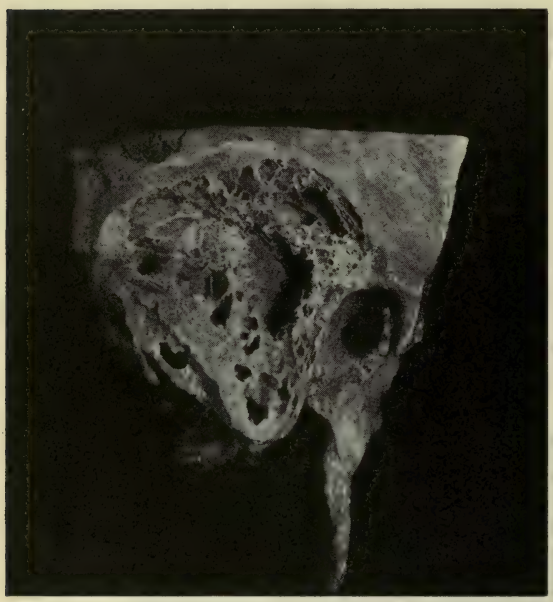


Fig. 25.—Right Adult Temporal Bone, showing extensive cellular formation. The cells have been removed from the lateral sinus groove.

If the mastoid cells, which always communicate with the antrum, have formed, the external signs will be lower down; sometimes these are very vague, but the discharge remaining profuse and mucopurulent, with pain and slight rise of temperature at night after the trouble has lasted a few weeks, will warrant operation. A most important sign is bulging of the postero-superior deep meatal wall close to the membrane; this sign alone shows that there is pus to be let out, and operation should be undertaken at once. Occasionally, and especially in influenzal cases, the course is extremely rapid, and the mastoid operation may have to be undertaken within a few days of the onset.

In operating when the mastoid cells (*Fig.* 24) are involved, the outer bony wall only should at first be removed. The inner wall of the bony wound should not be touched until the cavity has been cleared of blood and pus and it can be thoroughly inspected by means of reflected light from a head mirror or a head light, for the lateral sinus in its varying positions is frequently exposed by the disease, and sometimes the facial nerve, in the descending part of its course, lies naked at the bottom and front part of the cavity (*Figs.* 25, 26). All the affected cells must be exposed and their partitions removed to

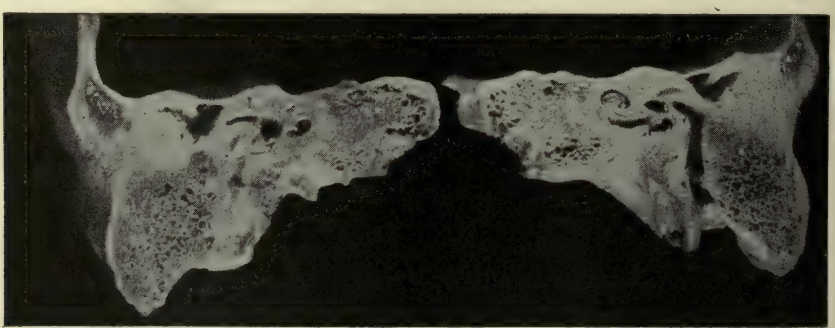


Fig. 26.—Right Adult Temporal Bone sectioned, and showing diploëtic infantile type of bone. Descending part of facial nerve marked in ink.

lay them open into the main wound. The ramification of the cells is sometimes very extensive. The outer wall of the antrum should be removed, as the cells which always line the internal aspect are usually affected, and the removal enables the surgeon to see if cells are running forwards into the zygoma, or upwards into the squamous portion, or back-

wards over the lateral sinus; the roof and walls of the antrum are also open to examination. The middle ear proper should never be touched when operating in acute cases. Healing takes place from the bottom, and the hearing result will be perfect.

The directions which pus may take are very numerous, and depend to a great degree on the anatomical condition. The pus may perforate into the meatus from the antrum or from the mastoid cells. It may get into the neck under the deep fascia through the inner aspect of the mastoid process (Bezold's perforation), or through the digastric or occipital grooves, and it may run down the neck as low as the clavicle, or push into the pharynx or soft palate.

Not infrequently (in about 15 to 20 per cent of all people) the mastoid cells are absent all through life, and as the outer wall of the antrum in these circumstances is frequently composed of bone of ivory density, and may be three-quarters of an inch thick, an empyema of the antrum may present no external signs; but the discharge will continue more or less, there will be some pain and temperature, and the sagging of the postero-superior deep meatal wall will be seen. In this condition the opening in the bone should commence high up behind the ear in Macewen's triangle, which is a good guide to the antrum in the great majority of cases. In the illustration (*Fig.* 27) the triangle is marked out.

Intracranial complications of every variety may occur as a result of acute inflammation of the middle ear.

In all cases of mastoid operation for acute empyema, the middle ear must not be touched. Pus should be tracked wherever it may run, and the cavities thoroughly opened.

Chronic Inflammation.— Chronic discharge from the middle ear is only a sign of disease, and results most frequently from an acute inflammation involving the antrum in bones which are devoid of mastoid cells and which have a dense outer antral wall and a dense layer of bone between the antrum and the diploëtic mastoid (acellulate type). (*Fig.* 26). The original infection is nearly always due to scarlet fever or measles. The exact local conditions must as far as possible be ascertained: the nature of the discharge; the site and extent of perforation of the membrane; the condition of the mucous membrane on the inner middle-ear wall; the state of the ossicles; the presence or absence of polypus, granulations, cholesteatoma, and caries of the walls of the middle ear and meatus; and as to whether pus can be drawn from the antrum by means of Peter's speculum after drying and cleaning of the middle ear. Signs of extension to the labyrinth must be looked for, and intracranial complications should be excluded; these are meningitis, cerebral or cerebellar abscess, and thrombosis of the lateral sinus. An *x*-ray photograph will show the presence or absence of mastoid cells.



Fig. 27.—Left Temporal Bone. The dotted lines and the posterior and superior outlines of Macewen's triangle show the amount of bone removed in performing the radical post-aural operation.

The nose, nasopharynx, and pharynx should be examined, and anything unhealthy, especially adenoids, should be removed. The general health should be carefully investigated. In cases of simple, uncomplicated perforation, the ear should be syringed night and morning with warm boiled boracic acid solution, half a pint being used at each sitting. It is best for a previously instructed person to syringe the ear in the same manner as in cases of cerumen. An ounce glass syringe, which should be kept aseptic either by boiling or by immersion in and filling with 1–20 carbolic acid solution, should have a narrow smooth point and a ridge on the barrel to prevent the fingers slipping off. An inch of indiarubber tubing on the point may be used. If it is impossible for some one else to use the syringe, a Higginson's aural syringe is used by the patient himself. If giddiness is produced, the ear should be syringed with the patient lying down, and assurance given that it is of no importance and that it will soon pass off. Inflation with Politzer's bag,

at first daily, with gradually increasing intervals, will be useful in keeping the Eustachian tube patent, preventing adhesions in the middle ear, clearing away discharge, and improving the hearing.

If the discharge is offensive, stronger antiseptics should be used, such as 1–4000 perchloride of mercury, or lysol ½ per cent. The syringing may be preceded by the instillation for ten minutes of perhydrol, 10 vol.

In some cases, especially if the perforation is large and the mucous membrane swollen, the following spirit drops instilled for ten minutes after syringing will be beneficial :—

℞ Pulveris Acidi Borici ℥j | Spiritus Vini Rectificati ℥iij

At first ten drops should be diluted with an equal part of hot boiled water, and if no pain is produced, the solution should be gradually increased in strength by lessening the amount of water, until it can be used pure.

If the perforation is in the top of the membrane (Shrapnell's membrane), it may be necessary for the surgeon himself to use an intratympanic syringe, the nozzle of which is passed through the perforation.

As improvement occurs, the intervals between the syringing should be gradually increased.

If after a few months the ear, although improved, remains stationary and the discharge palpably comes from the middle ear only, the cleansing treatment should be continued ; but if the discharge is still present, and if pus can be drawn from the antrum with Peter's magnifying speculum, the radical operation is indicated. If the hearing is good and the ossicles appear to be intact, they should be left.

If the patient states that the hearing is markedly but temporarily improved directly after syringing, it means that a cotton-wick '*artificial membrane*' placed against the ossicles or their remains will improve the hearing. The wick should be about one inch in length, and made of double cyanide wool. A piece of the wool is evenly pulled out, laid on hot boracic acid solution, and carefully rolled up. The calibre should be such as not to fill the meatus completely. The tip should be dipped in paroleine to prevent drying. A straight pair of untoothed forceps is used for its introduction. At first the patient should wear it for one hour a day, the time being gradually increased, hour by hour, until it can be worn all day. It should always be removed at night. If pain is produced the use must be discontinued, and after a time a further trial be made. The patient will get very expert in its use, and will be able to put it into the proper position more surely and quickly than the surgeon. It can often be used with marked benefit after the radical operation has been performed.

If there is much discharge the wick cannot be used, and if there is slight discharge the cleansing treatment should be continued.

Polypi and *Granulations*, unless malignant, indicate either neglect or caries of some part, and it is often impossible to say which. Some cases which look as if operative treatment will be necessary, rapidly heal up when the thorough cleansing treatment is used.

If a polypus, which is simply overgrown granulation tissue, project into or fill the meatus, it should be removed under a general anæsthetic and with all antiseptic precautions, by twisting, snaring, or curetting. The site from which it is growing should be gently curetted. In so doing carious ossicles may be removed. The meatus is afterwards lightly packed with iodoform ribbon gauze, and a gauze and wool dressing is applied. The dressing should be changed daily. If healing does not occur, even after a return for a short time to the cleansing treatment, and pus can be drawn out of the antrum with Peter's speculum, the radical operation will be required.

Granulations should be lightly touched with nitrate of silver, or chromic acid crystals, both of which can be fused on a probe. It will, however, often be necessary to curette the middle ear thoroughly under an anæsthetic.

Masses of epithelium, or so-called *cholesteatomata*, will often be seen to occupy the middle ear, with or without granulations. The masses can be got rid of by instilling warm perhydrol, 10 vol., for ten minutes before syringing. After removal, healing may occur under ordinary cleansing treatment, but frequently great destruction of parts is found, with implication of the attic, antrum, and mastoid cells—especially if the perforation is in Shrapnell's membrane—and demands the radical post-aural operation.

Caries of the Ossicles is very commonly found in chronic suppuration : the descending

process of the incus in inferior perforation ; and the head of the malleus and body of the incus, often associated with caries of the outer attic wall, in perforation of Shrapnell's membrane. Complete loss is also seen. Treatment as for chronic middle-ear suppuration. Removal of carious ossicles, with or without removal of the outer attic wall through the meatus, is not successful in stopping a middle-ear discharge, for the antrum is usually affected also, and they are removed during the performance of the radical operation.

With any of the above local conditions there may be signs of antral or mastoid implication which will demand a prompt radical operation ; or there may be intracranial complications, when the radical operation should always be performed as a preliminary ; for then not only is the origin of the trouble dealt with, but signs of extension from some part of the exposed cavities will show the way to the intracranial complication, the site of which is often doubtful.

Facial Paralysis may recover under treatment ; if it is permanent, the nerve may be joined to the hypoglossal, but the results are not encouraging.

The Internal Ear or Labyrinth is occasionally implicated. The chief symptoms characterizing the complication are increased and profound deafness, giddiness, vomiting, tinnitus, and nystagmus. In tuberculosis of the middle ear, implication of the labyrinth may be a quiet process. The labyrinth can be attacked surgically after a wide radical operation has been performed.

It may be said briefly that the radical operation consists in opening the antrum, tracking and removing disease wherever it may be found, removing the outer attic wall, clearing out the middle ear, and laying the antrum into the meatus by removing the posterior meatal wall. The dotted line in *Fig.* 27, and the posterior and superior outlines of Macewen's triangle, show the amount of bone removed in performing the operation.

Injury.—The membrane may be ruptured by direct or indirect violence. If by direct, the meatus should be purified, and a double cyanide gauze dressing in the meatus and over the ear should be applied.

If by indirect violence, such as condensation of the air in the meatus from explosion or blows, the deep meatus should not be syringed or touched, but the cartilaginous meatus, after being painted with iodine in alcohol 2½ per cent, should be lightly plugged with gauze wrung out in 1–2000 perchloride of mercury, and changed daily until healing is complete.

If sepsis occurs, the treatment will be the same as in an acute inflammation of the middle ear.

In fracture of the bone involving the middle ear, thorough purification of the meatus, auricle, and side of the head should be performed, and a large double cyanide gauze dressing applied.

Sarcoma.—Sarcoma of the temporal bone, involving or starting from the middle ear, demands the widest possible removal in as early a stage as possible, and the application of radium ; but often the progress is so rapid that palliative treatment is all that can be done.

Syphilis.—The middle ear is sometimes affected by the specific inflammation in the nasopharynx producing Eustachian obstruction, or even spreading along the tube to the middle ear. Ordinary antisyphilitic treatment and regular inflations with Politzer's bag will clear up the trouble. The nosepiece of the bag should be purified and kept distinct, and afterwards burnt, or a piece of drainage tube can be used in place of the nosepiece.

Tuberculosis.—Early tuberculosis of the middle ear is characterized by the painless onset of deafness, usually unilateral, associated with a red swollen condition of the membrane resembling that found in painful acute inflammation ; in other words, from the appearance of the membrane one would expect the patient to be in great pain ; but discomfort only is complained of. The infection may be secondary to tuberculosis of the lungs or of the nasopharyngeal tonsil (adenoids) or tuberculous infection of the nasopharynx, especially in infants. The disease may progress very rapidly, attacking the bone, producing facial paralysis, mastoid disease, caries or necrosis of the labyrinth, and extension to the meninges, spreading through the diploë. Glandular infection occurs early.

The local treatment, combined with sanatorium and general treatment in the early stage, is to purify the meatus and keep an antiseptic dressing on it. The discharge is slight unless further infection occurs, when it becomes profuse and offensive, requiring frequent syringing with 1–4000 perchloride of mercury, or lysol ½ per cent.

If adenoids are present they should be removed. If there are signs of bone implication the ear should be turned forwards and all affected bone freely removed, the resulting wound being lightly stuffed with iodoform gauze, and allowed to heal from the bottom. If the labyrinth is attacked it may be dealt with after a wide radical operation has been performed.

The affected glands should be removed at a separate operation. Tuberculin treatment may be tried.

If the facial nerve is completely destroyed, the distal end may be joined to the hypoglossal. (*See also* SPECIFIC THERAPY, and PULMONARY TUBERCULOSIS.)

IV.—INTERNAL EAR.

Anæmia.—Tinnitus and deterioration of hearing due to anæmia or to great loss of blood yield to general treatment.

Congestion.—Deafness and tinnitus are seen in patients who live too well, take too much alcohol and tobacco, and have no exercise. The treatment consists in strict dieting, abstinence from alcohol and tobacco, regular exercise, massage, Turkish baths, and calomel purgation.

Deaf-mutism.—Occasionally in those cases in which the deafness is due to chronic suppuration of the middle ear, the hearing may be improved by treatment sufficiently for the patient to acquire speech in the normal way. In a few cases in which the deafness is due to Eustachian obstruction caused by adenoids, the removal of the growth and subsequent inflations will be followed by the best results. In the great majority of cases, which are due either to malformation or incurable disease of some necessary part of the hearing apparatus, speech will have to be acquired by the teaching of lip-reading according to the German method. Tuition should begin about the age of five years.

Preventive treatment consists in avoiding the marriage of those in whose family deaf-mutism, due to malformation, is plainly hereditary, and of those who are consanguineous and in whose families there are signs of degeneration, such as deaf-mutism, epilepsy, idiocy, or lunacy.

Drugs.—Those which most commonly cause deafness are quinine, salicylate of soda, nicotine, alcohol, lead, and arsenic, including salvarsan. The treatment consists in avoidance, especially in those who are already deaf.

Quinine deafness is common among those who live in malarious districts; yet the drug is often taken as a prophylactic in a very haphazard way. The deafness and tinnitus are often transitory, but if the drug is persisted in, incurable deafness of varying intensity may be produced. The evil effects on the hearing may be prevented or lessened by combining it with dilute hydrobromic acid in doses of from ½ drachm to 2 drachms with each dose of quinine, or by giving the quinine hypodermically; arsenic should be tried as a substitute in those who are susceptible.

If *Nicotine* is traced as a cause, it should be absolutely prohibited, and courses of strychnine given. In all cases of deafness, smoking is distinctly injurious.

Lead deafness should be treated by sulphate of magnesia, internally, and the taking of proper precautions by those who work with it.

Exudation.—This occurs in leukæmia and mumps. Treatment consists in rest, blistering behind the ear, and the administration of iodide of potassium. Hypodermic injection of pilocarpine once a day for ten days may be tried. The deafness in typhoid fever is probably a toxic neuritis, and usually passes off without treatment about the sixth week.

Hæmorrhage.—This is apt to occur in whooping-cough, anæmia, nephritis, and diabetes. The treatment is unsatisfactory. It should consist in the treatment of the cause, and rest, with iodide of potassium internally. Daily hypodermic injections of pilocarpine for ten days may be tried.

Inflammation.—This may be due to extension from the middle ear or from the meninges in cerebrospinal meningitis. If it is due to the former, complete rest, both general and functional, should be insisted on; the back of the ear should be blistered, hot fomentations applied over the ear, and a calomel purge given. If the symptoms of giddiness, vomiting, markedly increased deafness, and high temperature, with lateral headache, persist, the outer wall of the labyrinth should be exposed by a wide radical

operation ; if improvement does not occur in three days, the labyrinth will have to be opened and drained through the vestibule, both in front of and behind the facial nerve. It may be necessary to remove the entire labyrinth. Not infrequently caries will be found in some part of the outer labyrinthine wall, requiring free opening and drainage ; or sequestration of part or the whole of the labyrinth may be found and removed. In cases due to cerebrospinal meningitis, treatment consists in complete rest, with blistering behind the ear and a calomel purge. Iodide of potassium should be given internally, and pilocarpine hypodermically, daily for ten days. The prognosis is often very bad, the disease in young children frequently resulting in complete deafness and consequent mutism, necessitating lip-reading lessons.

Injury.—Punctured wounds or fracture at the base of the skull involving the labyrinth should be treated by strict purification of the ear, meatus, and side of the head, and the application of a double cyanide gauze dressing. The result as regards hearing is very bad, and treatment is futile. Excessive condensation of the air in the meatus may be transferred to the labyrinth through the ossicular chain, as in explosion and blows, producing concussion of the auditory nerve in the labyrinth. The treatment is preventive. Those who are likely to be exposed to explosions, such as sailors, soldiers, and sportsmen, should have healthy ears, noses, and throats, and should plug the ears with a mixture of modelling clay and fibre. The 'clay fibre', as it is called by Sir William Dalby, who originated it, may by a little manipulation be made soft and pliable, and therefore fits any ear. A fairly large piece should be used. Sportsmen should protect the left ear, which is the one always affected, unless shooting takes place from the left shoulder. Recovery may take place more or less on rest : other treatment is useless.

All who work in a constant noise, such as boilermakers, and those in the navy who are exposed to the constantly repeated high-pitched penetrating report of the lighter guns, gradually become deaf. The variety of deafness has been likened to the blindness produced by excessive exposure of the eyes to a bright light. The treatment is prevention, by wearing the clay fibre. When the deafness is once established treatment is useless.

Ménière's Disease is a hæmorrhage into the labyrinth and is decidedly rare, but the symptoms are common to many labyrinthine troubles which occur by injury, foreign bodies, cerumen, spread of infection, mumps, syphilis, diabetes, kidney disease, circulatory troubles, cerebrospinal meningitis, leukæmia, anæmia, auditory nerve tumour, and geniculate ganglion inflammation. A cause for the labyrinthine symptoms should always be carefully searched for, and even in the most unlikely cases a Wassermann test should be made if no other cause can be found. Treatment depends on the cause. If no cause can be found, treatment should be directed to anything which might cause increased tension. Not infrequently labyrinthine giddy attacks are associated with low blood-pressure (Jenkins). A milk diet is often valuable. Dilute hydrobromic acid, in doses from 40 minims to 1 or 2 drachms three times a day, should be given, and counter-irritation behind the ears by means of blistering should be kept up for a considerable time. Very rarely the symptoms call for an operation on the labyrinth.

Neurasthenia.—Those who have undergone severe mental strain or worry for a great length of time, without proper rest and exercise, often suffer from deterioration of hearing, and sometimes tinnitus. The treatment consists in rest, change of surroundings, and the giving of strychnine. Sometimes it is necessary for patients to undergo a formal rest cure. A great shock may cause sudden complete functional deafness. Rest and change, with the application of faradism behind the ears, will, as a rule, effect a cure ; sometimes, however, treatment has no effect ; but the hearing often returns spontaneously, perhaps after a counter-shock.

Otosclerosis.—This disease is a thickening of the bony labyrinth, producing fixation of the stapes. It is the cause of most of the intractable cases of deafness. It is more frequently seen in women, is very insidious in its onset, is not due to catarrh, although this may also be present ; there is no Eustachian obstruction or depression of the membrane. Hearing better in a noise is usual, and is often noticed from the onset of the deafness. If, as not infrequently occurs, one ear is badly affected and the other fairly good, the hearing better in a noise in the former can only be elicited by blocking up the latter in a noise, and is a valuable means of diagnosis. Sometimes the deafness remains stationary for a long time. Heredity is a marked feature. Child-bearing has a distinctly

prejudicial effect; in fact, some patients date the onset from a confinement. Absolute deafness does not result.

There is no treatment which can be said to have a really distinct effect upon it. Phosphorus in doses of $\frac{1}{100}$ gr. in the middle of a meal, twice a day, for six weeks off and on, may be tried in the early cases. If catarrh is present, it should be treated in the usual way. The patient should live as healthy a life as possible, and in the later stages artificial aid will be necessary in the form of a trumpet, speaking-tube, or electrical aid. It is a good plan for the patient to go to a trustworthy maker and try the various forms of aids, as it is impossible to say which will be most useful. All the patients unconsciously learn a certain amount of lip-reading, and it is wise to have lessons from a good teacher fairly early in the course of the disease. Co-existent anæmia and rheumatism should be treated.

Senile Deafness.—About the age of sixty a gradual deterioration of hearing, without tinnitus, takes place. Local treatment is useless. Treatment directed to the general health and to arteriosclerosis in particular is all that can be done.

Syphilis.—In congenital syphilis, the treatment consists in repeated blistering behind the ears continued for many months. One ear should be blistered at a time, in order that the patient may be able to sleep comfortably. Iodide of potassium and mercury are quite useless. If the deafness becomes absolute, lip-reading should be taught.

In secondary acquired syphilis, the patient should be placed under the influence of mercury and salvarsan as soon as possible. Blistering should be applied behind the ears, and hypodermic injections of pilocarpine should be given every day for a fortnight.

In the later stages of the disease, deafness may be associated with facial paralysis and giddiness. Recovery may take place under inunctions of mercury, iodide of potassium internally, and blistering behind the ear.

Internal-ear deafness, probably due to sclerosis of the auditory nerve, is sometimes associated with tabes, and may be the first sign; or a gradual onset of nerve deafness, with a continuous hissing, tinnitus, sometimes with giddiness, without any other nerve complication, may be met with.

The treatment is on general antisyphilitic principles.

Tinnitus.—This is merely a symptom; treatment of the cause will do all that can be done. The cause is sometimes difficult to find, and requires the most patient local and general investigation.

In nervous patients the unavoidable noises are exaggerated, and sedatives are required. Bromide of potassium or dilute hydrobromic acid, in ½-drachm to 2-drachm doses three times a day, is sometimes useful. Strychnine should be given to those who are run down. Anæmia, and cardiac or renal disease, will require treatment. Patients often think that the noises mean some brain trouble, and that they are going to become insane; reassurance on this point is often a great relief. If the noises take a purposeful form, such as the hearing of voices or airs, it is a sure sign that the patient is or will be insane, and the friends should be warned. A history of lunacy in the family can usually be obtained.

Toxæmia.—Nerve deafness with tinnitus coming on before the age of sixty without apparent cause, and syphilis and drugs having been excluded, demands thorough examination for some source of sepsis, especially of the teeth and gums, tonsils, and accessory nasal sinuses.

Tuberculosis.—The infection of the internal ear invariably spreads from the middle-ear tract. The most usual sites of attack are the promontory and its neighbourhood, and the external semicircular canal where it forms the inner boundary of the opening of the antrum into the middle ear. The infection may spread through the diploë round the bony labyrinth, producing necrosis of part or whole. The treatment is removal after a wide radical operation has been performed.

Vertigo.—True auditory vertigo is characterized by the moving of objects round the patient in one direction or another, with falling or staggering, and the association of tinnitus, vomiting, and nystagmus. It is only a symptom of labyrinthine trouble, and the treatment depends on the cause. Broadly speaking, rest, a calomel purge, light diet, and dilute hydrobromic acid in large doses are indicated. *A. H. Cheatle.*

ECLAMPSIA.—This is a disease characterized by two striking symptoms: epileptiform convulsions, and coma between the convulsions. Coma is an essential part of the disease, and in a fatal case there may occasionally be coma without fits.

It is generally agreed that eclampsia is due to a toxin circulating in the blood-stream. This toxin acts as a powerful vasoconstrictor, and the blood-pressure becomes markedly raised. When a definite and lasting rise of blood-pressure is detected in the later months of pregnancy, it strongly suggests impending eclampsia, because during the whole course of normal gestation there is little or no alteration in arterial pressure. Many years ago the writer described how the toxin —which is chemically almost identical with adrenalin—constricts the renal arterioles, and so alters the circulation of blood through the kidneys that the secretion of urine becomes greatly diminished, and finally entirely arrested. The blood-pressure is highest when the anuria is complete, and in order to get urine secreted again it is absolutely necessary to lower the pressure. As a result of the altered circulatory conditions in the kidney, and because the toxin acts as a protoplasmic poison, albumin appears in the urine: sometimes in small amount only, but more usually in sufficient quantity to boil solid in a test tube. Very occasionally the urine is free from albumin, or this is present only in the merest trace during the fits. Albumin in the urine of a pregnant woman is generally looked upon as the danger signal of eclampsia, and as soon as it is detected every effort must be made to arrest the progress of the toxæmia before it culminates in convulsions. The quantity of urine is nearly always diminished when eclampsia is impending, and this symptom may be noted before the appearance of albumin. Another constant and striking feature in eclampsia, and in impending eclampsia, is that the urea secretion is *always* diminished. This points to a serious disorganization of the metabolism.

Recent investigations have thrown light upon the *nature* of the toxin, and in the view of the writer the condition of eclampsia can be traced to the action of an adrenalin-like body, possibly para-hydroxy-phenyl-ethylamine. This toxic amine acts firstly upon the renal arterioles, causing suppression of urine, and secondly upon the cell protoplasm of the whole nervous system—central and sympathetic. Serious changes are also produced in the larger glandular organs—liver, kidneys, etc. Although this amine is *normally* derived from tyrosin, by bacterial action in the lower intestine, it is also elaborated in a most active and potent form, *during pregnancy*, as a result of initial putrefaction of the placenta. It now seems quite likely that this can sometimes occur in utero, possibly as the result of small decidual hæmorrhages; and in a small portion of *dead* placenta, as in putrid meat, this powerful pressor substance is formed. The writer believes that a colon-bacillus infection commonly plays an important rôle, for some bacterial action seems to be an essential factor.

Eclampsia may come on during pregnancy before labour has begun, and then, under proper treatment, the fits and coma may pass off, and delivery take place later with no untoward symptoms. But matters do not often end so favourably; usually labour commences, and the fits increase in number and severity. Generally speaking, indeed, the earlier the symptoms arise during pregnancy the greater the danger. Most commonly eclampsia attacks the patient during the first stage of labour, and then the treatment is more likely to be successful, especially if labour goes on rapidly, or can be hurried on. In other cases the fits start after delivery is completed—*post-partum eclampsia*. Death from puerperal eclampsia may take place from coma with heart failure, even after one fit; from cerebral hæmorrhage; from hyperpyrexia; or from late bronchopneumonia, set up by the buccal secretions or by particles of food getting into the bronchial tubes.

The prevention of eclampsia is more hopeful than its cure, but one must admit that the disease cannot always be prevented even when its approach is suspected. The fits may come on with startling suddenness at a time when the patient is apparently in perfect health and under the eye of a competent physician. But in the vast majority of cases the onset is heralded for several days, often for longer, by certain well-recognized toxæmic symptoms, such as severe headache, dimness of sight, giddiness, vomiting, epigastric pain, and swelling of the face and limbs. Every woman, when she comes to engage a doctor for her confinement, should be carefully warned by him of the possibility of such symptoms arising in the later months of pregnancy, and, if she suffers from any of them, should clearly understand that a sample of her urine must immediately be sent for examination. Otherwise it is highly probable that the first announcement of the disease will be a fit.

There are certain features which indicate a *bad prognosis* in eclampsia: œdema absent, or present to only a slight degree; coma, if markedly present after the first fit, or when deep and prolonged; pulse continuing rapid between the fits; albuminuria in small amount only, or absent during fits; urea excretion less than one per cent; temperature high and not remitting; jaundice, if associated with deep coma and anuria; anuria complete, and persistently so under treatment. In *post-partum* eclampsia the prognosis is not invariably bad, especially if the first fit occurs within a few hours after delivery; occurring later, it is much more dangerous, particularly in multiparæ—the prognosis is then bad. Maniacal symptoms and extreme restlessness seem to be of favourable significance. In any case the prognosis is greatly improved if the secretion of urine

can be fully re-established, and, more important still, if the urea output can be made to increase steadily. The least dangerous cases are those in which only a few fits occur during a rapid natural labour. In the eclampsia of pregnancy, if the fœtus dies the result for the mother is generally favourable ; indeed, fœtal death at any time in the course of eclampsia seems to improve the mother's chances of recovery. The maternal mortality under the best treatment is still about 20 per cent, and 50 per cent of the infants are lost.

1. **Treatment of Albuminuria in Pregnancy (Threatened Eclampsia).**—Since it it is one's duty to try and prevent eclampsia, the treatment of albuminuria during pregnancy must be considered first. Slight albuminuria towards the end of pregnancy or at the commencement of labour may in no way indicate impending eclampsia. The symptom may be due to pressure alone, as in twin cases. With a marked reaction for albumin, diminished quantity of urine, low gravity—pointing to a lessened urea excretion —and possibly casts, the case must always be treated as one of threatened eclampsia. The blood-pressure in the great majority of these cases is considerably raised—150 to 180 mm. Hg or higher—the peripheral vessels are contracted, and there is œdema of the face, neck, limbs, and often of the body generally. The œdema may be of a myxœdematous nature, not pitting on pressure. The blood-pressure should always be accurately estimated in these cases by means of a sphygmometer of the Riva-Rocci type. The blood-pressure chart is the most reliable index of the influence of treatment.

First, always put the patient to bed. Chills are then avoided, and the beneficial effect of rest in lessening metabolism is secured. It is well to know from day to day how much urine is being secreted, and its gravity. The diet of these patients is a very important matter. When there are ominous symptoms, such as high blood-pressure and impaired vision, give milk and nothing else for the first week. If improvement follows, one may soon add Benger's food, Allenburys' diet, milk puddings, etc. As constipation is certain to be present to a greater or less extent, begin by giving a large enema of soap and water to wash out the bowel. A dose of compound jalap powder (30 to 60 gr.) should be given, and, if necessary, repeated next day. At all events a regular aperient dose must be given every night so long as the patient is under treatment ; a pill containing aloin, calomel, and extract of belladonna, $\frac{1}{4}$ gr. of each, followed in the morning by a saline such as magnesium sulphate, answers admirably. When there is great general œdema, elaterium ($\frac{1}{4}$ gr.) acts better than anything. It is also well in severe cases to employ rectal lavage with hot water from time to time. In these cases paraffin as an aperient is most useful, for in addition to its lubricating action it may limit the absorption of toxins through the intestinal walls. When renal activity is unsatisfactory, a mixture containing acetate of potash (30 gr.), and solution of ammonium acetate (2 to 4 drachms) may be given four-hourly. When the blood-pressure is strikingly high, no drug can compare in usefulness with potassium iodide. With the patient in bed, 10-gr. doses thrice daily will seldom fail to lower the pressure and greatly benefit all the symptoms. The iodide should be well diluted, and may be combined with pepsencia. Spirit of nitrous ether may be given in addition in drachm doses. The action of iodide in these cases is very subtle, probably an indirect one through the thyroid gland. For many years it has been known to exert a specific effect on pregnancy albuminurias.

In 1901 the writer suggested the use of thyroid extract in the toxæmic albuminurias of pregnancy, and in eclampsia. Thyroid powerfully stimulates the metabolism, and increases urea excretion. In conjunction with the parathyroid secretion it is definitely antitoxic, and protects the central nervous system from the baneful action of certain toxic amines of the adrenalin type, elaborated as a result of bacterial growth in the intestinal canal. For these reasons, and because it is a vasodilator and diuretic, it tends to bring many of the abnormal circulatory and urinary features of impending eclampsia nearer to the normal again. A 5-gr. tabloid (B. W. & Co.) may be given twice or thrice daily.

The albuminuric patient should drink plenty of Vichy, Contrexéville, or plain water. The skin must be kept acting well. Turkish baths may be used, or the patient may have rather long immersions in a hot bath and be put back to bed in a warm blanket. In more threatening cases a 'hot wet pack' may be advisable to produce full action of the skin. Chloral (15 to 30 gr.), bromide (30 to 60 gr.), or barbitone (veronal) (8 to 12 gr.), may be used at bedtime to relieve restlessness and promote sleep. Almost all the cases treated in this way escape eclampsia.

In a case of albuminuria with severe toxæmic symptoms, accompanied by very high blood-pressure and persistently low urea excretion, if little or no improvement results from treatment, labour should be induced. This is perhaps especially called for in primiparæ, and may be done, in certain circumstances, even before the viability of the child. Induction of labour is a slow process, but there is generally time to employ it successfully. In a very severe pregnancy toxæmia, however, if the patient shows signs of jaundice, and more particularly if her sight becomes worse and worse, it is safer and better practice to anticipate the onset of convulsions by *immediate* removal of the uterine contents. This is best done by means of abdominal Cæsarean section.

2. **The Treatment of Convulsions in Pregnancy, Labour, or the Puerperium (Actual Eclampsia).**—The treatment of actual eclampsia is simply an extension of the methods mentioned above, and, naturally, the more alarming the symptoms the more active must the treatment be. If the patient is seen during a fit, give chloroform or ether to control it temporarily. Then give a hypodermic injection of morphia sulphate, $\frac{1}{2}$ gr., with or without atropine ($\frac{1}{100}$ gr.).

Morphia must be given in *large* doses ($\frac{1}{2}$ to $\frac{3}{4}$ gr.), for then, as the writer pointed out many years ago, its action is that of a powerful vasodilator, and it corrects the abnormal circulatory conditions in the kidney in eclampsia, thus enabling the organ to secrete urine again. It is, of course, also an eminently suitable remedy to soothe the nervous system and subdue restlessness, but that action is of quite secondary importance. It also causes profuse diaphoresis. No single drug is so valuable in this disease, if enough is given. If the fits continue, give another $\frac{1}{2}$ gr. one or two hours after the first dose, and go on giving the drug in similar doses, every two hours if need be, to keep the patient quiet. Two or three grains may have to be given in twenty-four hours, but with the other methods of treatment employed, it is seldom that nearly so much is required. During each fit chloroform or ether should be given, and only when the patient is under the influence of the anæsthetic should she be examined to ascertain the stage and progress of labour. Care must be taken that the tongue is not bitten during a fit. This is prevented by means of a cork, or piece of wood, placed between the teeth. No medicine or food must be given by the mouth until the patient is fairly conscious, or it may find its way into the lungs and set up pneumonia. Keep her on her side while she is deeply comatose, so that saliva may trickle out of the mouth instead of possibly finding its way into the larynx. Many cases of eclamptic convulsions are successfully treated, in general practice, simply by the methods already mentioned. The practitioner gives a powerful purgative, washes out the rectum, uses chloroform if necessary, and injects half a grain of morphia. He may also order a 'hot wet pack'—stone ginger-beer bottles filled with hot water, put into wet socks, and packed round the patient. If labour is going on he probably hurries it up, using forceps toward the end. He lets the patient bleed as freely as possible in the third stage, and does not give ergot. There may be a fit or two afterwards, but the recovery is uninterrupted. These are mainly cases where the fits occur actually during labour—are perhaps initiated by some definite external stimulus.

The question of *bleeding* as a valuable therapeutic measure in eclamptic cases must be referred to. If the blood-pressure when estimated, as it should be in every such case, is found to be 150 to 180 mm. Hg or higher, one should bleed freely from the arm. In almost every severe case of eclampsia, bleeding from a large venous trunk is physiologically the correct thing, since it is the easiest way—short of bleeding the kidney direct—of emptying the congested renal veins and thus enabling the kidney to resume its function of secreting urine freely.

Recently *veratrone*, a non-alcoholic solution of the active principles of veratrum viride, specially prepared for hypodermic use by Parke, Davis & Co., has been employed mainly for the purpose of controlling the fits. The full dose is 1 c.c., which equals 20 min. of tincture of veratrum viride (B.P., 1885). When the pulse-rate is rapid, the blood-pressure high, and fits are frequent, veratrone, injected deeply into the muscular tissue of the thigh, produces very definite results. The pulse-rate may drop to 50 or 60 per minute, and the pressure fall 40 to 60 mm. Hg. When the blood-pressure is lowered by veratrone, the pulse-rate is also greatly slowed; hence the drug profoundly depresses the heart muscle. It also exerts a powerfully depressant effect on the motor tracts of the spinal cord, and likewise produces a remarkable lengthening of the contraction of the

voluntary muscles. For these reasons the convulsive seizures may be quite prevented. Veratrone probably also depresses the vasomotor centre, and, by enlarging the arterial calibre, will, like morphia, rapidly re-establish the secretion of urine. If the blood-pressure again rises considerably, a second injection is desirable, for the fits may then return. The slow pulse is here an index of lowered pressure ; if under 60 per minute there is comparative safety. Should the drug cause alarming depression, strychnine ($\frac{1}{30}$ gr.) may be injected hypodermically. In cases where veratrone is used, it is seldom that bleeding is necessary or advisable. Morphia is not contra-indicated, however ; the two drugs may be usefully given together. Veratrone is especially valuable when fits are frequent and severe, and should be given in $\frac{1}{2}$-c.c. doses.

The principles of treatment, then, in eclampsia, are shortly as follows : (1) *Control the fits.* To fulfil this indication an anæsthetic may be necessary at first, and ether is safer than chloroform, but preferably use morphia or veratrone, with a free hand. (2) *Get the toxin out of the body.* Bleeding removes some toxin ; it is by means of the kidneys, bowels, and skin that the remainder is removed. But this work is mainly done by the kidneys, and the complete or nearly complete suppression of urine is really the one symptom which must be promptly and vigorously treated. The toxin has acted on the renal vessels in such a manner that the steady flow of blood through the kidney, essential to a free secretion of urine, is interfered with. If one can get venous blood out of the organ, and at the same time produce complete relaxation of the systemic arteries and arterioles, one produces the desired result of getting blood to flow freely again through the renal glomeruli. Morphia, in these large doses, is the ideal vasodilator because it acts so swiftly. Thyroid extract, 30 to 40 gr. every three or four hours, to produce 'thyroidism' rapidly, is equally efficient, and should be used after the morphia when the patient can swallow. It may actually be antidotal to the adrenalin-like toxin. Veratrone appears to act in a similar manner by lowering the blood-pressure. (3) *Get the uterus emptied if the fits cannot be satisfactorily controlled.* This is a principle of treatment mentioned here only in order to condemn *accouchement forcé* in all but very exceptional cases. It is good practice often to accelerate labour cautiously, but it should be done gently, by means of manual dilatation, or by the use of de Ribes' bag, followed by the application of the forceps. In an elderly primipara, or when there is a long, rigid cervix, and the case is near full term, *early* Cæsarean section is often sounder treatment than slow, difficult delivery by the vaginal route. If prolonged anæsthesia is necessary, chloroform should not be used.

In the *more severe cases*, the following methods of treatment should be employed in addition to morphia, thyroid, etc. :—

1. *Bleeding from a vein.*—The median basilic vein is chosen. If the patient is not comatose, give ether, and apply a bandage round the upper arm to make the forearm veins stand out. Then, in most cases, it is easy to tap the distended vein with a needle of large bore, as one does when drawing off blood for a Wassermann test. Otherwise make an incision over the vein and expose it. Bleed to the extent of 10, 15, or 20 ounces, judging by the pulse, or preferably by the blood-pressure, when sufficient blood has escaped.

2. *Subcutaneous infusion of hot saline solution.*—Twenty ounces or more of hot normal salt solution are run slowly into the loose tissue under the mamma, axilla, or inside of thigh. Sterilize the skin at the site of injection with iodine. The saline is made by adding one teaspoonful of common salt to each pint of boiled water cooled to a temperature of 103°–105° F. One uses a glass funnel, a length of tubing, and a sharp-pointed metal cannula. The funnel is elevated about four feet, and the fluid flows readily into the areolar tissue, and is quickly absorbed. Sometimes the warm saline is run directly into the vein, after bleeding. Recent experience has convinced the writer that this method is not unattended with danger in eclampsia, owing to the blood changes, and that the subcutaneous injection is an equally useful and perfectly safe alternative. When a quantity of hot saline is thus introduced into the circulation, the effect is to relax the contracted arterioles, and lower the blood-pressure. In this way one of the factors essential to the re-establishment of diuresis is brought into action. Therefore such an infusion acts as a powerful diuretic in eclampsia. A continuous rectal saline, very slowly delivered at low pressure, is a good method of getting fluid into the tissues. The foot of the bed is raised, and the reservoir containing the saline is fixed at a level of only a few inches higher

than the rectum. Then the bowel will retain and absorb a very large quantity of salt solution. Glucose and sodium bicarbonate may be added also.

3. *Washing out the stomach with hot water.*—While the patient is under an anæsthetic, a soft rubber tube is passed into the stomach. Hot water at a temperature of 110° to 115° is poured down the tube through a funnel until the stomach is quite filled. Then the tube is pinched between the finger and thumb so as to keep it full of water. This is important, because it is only by leaving the stomach tube full of water that it will act as a siphon when the funnel is inverted. Wash out several times, and leave the hot water in the stomach for several minutes at a time. This is, in the writer's opinion, a valuable method of treatment. The rationale is not to wash away undigested food, as some obstetric surgeons teach. One of the main functions of the mucous membrane of the stomach is to excrete into its cavity toxic substances which are present in the blood. This is the way in which snake venom and drugs like morphine are partly excreted; hence the value of the permanganate treatment of morphia poisoning. The same thing almost certainly happens with the toxin of eclampsia, so the stomach washing carries a certain amount out of the system. Again, in the stomach and intestines there is an enormous area of blood-vessels which, if fully dilated, will readily draw away blood from adjacent organs such as the kidneys. Very hot water in the stomach acts *directly* on this large vascular area, and the capacious splanchnic vessels become relaxed. This is a practical method of getting blood out of the renal veins.

4. *Leaving a solution of magnesium sulphate in the stomach.*—Before the withdrawal of the tube, a concentrated solution of sulphate of magnesia (4 to 6 oz. dissolved in 5 to 8 oz. of water) is poured through the funnel and left inside the stomach. In case the patient is apt to vomit after this, the anæsthesia is prolonged for a little. The very free purgation from the intestine following this dose is a most useful effect, and it is more precise and altogether better than croton oil. Eclamptic patients are generally very constipated, so in addition to leaving a purgative in the stomach in this way, one should also wash out the bowel frequently with hot water.

Some patients become highly restless, noisy, and almost maniacal, instead of lying semi-comatose, as is usually the case. Then chloral is useful. It may be given by the mouth (30 gr.) if the patient can swallow, or per rectum (60 gr.). It also acts well hypodermically (6 to 10 gr. in 1 drachm of distilled water).

When jaundice is present, sodium bicarbonate should be given in large doses (60 gr.) frequently, as for impending diabetic coma, with only skimmed milk and water.

The treatment of *post-partum* eclampsia is the same as that mentioned above. If fits occur frequently and anuria is persistent, it is possibly worth while to expose each kidney in turn, and either decapsulate it after the manner of Edebohls, or bleed it freely by cutting deeply into its lower border.

On the theory that there is some substance in normal blood that neutralizes the toxin of the placenta, Blair Bell has recently tried the transfusion of blood in eclampsia.

H. Oliphant Nicholson.

ECLAMPSIA NEONATORUM.—(*See* Convulsions, Infantile.)

ECTOPIA TESTIS.—(*See* Testicle, Imperfectly Descended.)

ECTROPION.—(*See* Eyelids, Diseases of.)

ECZEMA.—It is absolutely impossible to describe the treatment of eczema as a whole. The term is constantly and grossly abused, and the writer has for long taught that the more one knows about skin diseases, the fewer cases he finds it necessary to label 'eczema'.

Many cases, many more than are generally suspected, are due to some external irritant to which the patient is consciously or unconsciously exposed, and the removal of this is essential to success in treatment. Some are connected with the patient's work, and are notorious irritants, such as sugar in the baker's eczema, soda in the washerwoman's, and various chemicals in the photographer's. In plants, too, one has an enormous number of possible irritants, and all 'eczemas' of the exposed parts should suggest to the physician the possibility of their having been brought about in this manner.

The treatment, then, consists in finding out what has produced the dermatitis, and, if possible, avoiding it; the treatment of such cases as one is unable to find a cause for resolves itself into purely symptomatic management. The chief complaint in an acute dermatitis is itching, and for this there is no application so generally valuable as a lead and tar lotion :—

℞ Liquoris Carbonis Detergentis,		Glycerini	℥j
Liquoris Plumbi Subacetatis Fort.	āā ℥ij	Aquam	ad ℥vj
Zinci Oxidi	℥iij		

If the acute stage is past, but there is considerable exudation, it will probably be found that a paste is the most convenient application. Lassar's paste :—

℞ Zinci Oxidi		Vaselini	℥ss
Pulveris Amyli	āā ℥ij		

has deservedly won for itself great popularity in the treatment of 'eczema'.

In the scaly forms, ointments are indicated, and here once more tar takes a prominent place in treatment, used in a more concentrated form than in the acuter varieties. White's formula is a very useful preparation :—

℞ Picis Carbonis		Pulveris Amyli	
Zinci Oxidi	āā iv	Paraffini Mollis	āā xvj

M. Ft. Pasta.

Common crude tar, fresh from the gas works, is a very valuable application in many cases. The part should be washed free from grease, and then the tar should be applied with a stiff painter's brush in *as thin a layer as possible*. It dries rapidly, and though it looks dirty it does not soil the clothes as ointments do. It is well to make a small experimental application in each case, for in a minority of cases tar acts as an irritant. If it causes no irritation on the trial spot it may be fearlessly applied to a large surface. In very chronic forms, where the case proves rebellious to ordinary treatment, it is often desirable to convert the chronic into an acute dermatitis, and this is best done by the application of caustic potash according to the method of Hebra. A piece of wool, dipped in liquor potassæ, is scrubbed vigorously to and fro over the patch until a number of red oozing spots appear. The potash is then washed off with warm water, and lead and vaseline ointment (emplastrum plumbi 1, vaseline 1) applied. The relief from itching following on this application is often marvellous, and although it is excessively painful at the time, patients receive so much benefit from it, that they usually return with the request that the application be repeated.

General Treatment.—While the relationship of indigestion to eczema is very much exaggerated, it is certainly the case that digestive disturbances aggravate an existing eruption and may cause it to persist, as its disappearance when the digestive functions are restored proves. These should therefore be inquired into, and suitable treatment prescribed. When there is no such disturbance, it is unnecessary to put the patient on any specified diet. Good plain food does no harm to anybody. But there are certain articles of diet which are particularly injurious to the inflamed skin. Of these, the first place is occupied by alcohol, and unless there are very urgent reasons to the contrary, patients with eczema should be total abstainers. Close on alcohol, as aggravating factors, come spices and condiments, chutney and curry running it very hard. Coffee, salted viands, and strong-tasted cheeses are less, though still, injurious, and the writer has met with a number of patients who were convinced that apples were harmful. He does not believe that this is generally the case, but it is perhaps worth mentioning, for in chronic cases the patient himself can do much to help on his own recovery by a close observance of those articles which experience shows him to be injurious.

Drugs have very little effect on dermatitis, and in particular arsenic is only valuable in those cases of dry scaly 'eczema' which one has, as a rule, little difficulty in curing by other means.

Like other diseases, it has been attacked by electricity, and it seems certain that cases have benefited wonderfully under *x*-ray and high-frequency treatment, though it is obvious that these are applicable only in special circumstances, and are not likely to be adopted as a routine method. (*See also* Gout.)

Norman Walker.

ELECTROTHERAPEUTICS.—While many methods of electrical treatment come solely within the domain of the specialist, much can be done by the general practitioner with the galvanic and faradic currents without elaborate or costly apparatus. It is proposed in the present article to describe a simple form of galvanic and faradic apparatus, and explain how it is used for the treatment of common ailments. More elaborate methods, and the use of complex machines, such as the high-frequency, diathermy, and static apparatus, will be very briefly described, in order that the practitioner may learn the nature of the treatment, and the diseases which can be successfully treated by the specialist in electrotherapy.

I.—APPARATUS.

A.—Source of Galvanic Current.—If the practitioner has no access to a main supply, he can derive the galvanic current from cells ; 30 or 40 will be required. If small dry cells are used, 32 can be packed in a box so as to form a portable battery. Such batteries can be obtained from makers of electro-medical apparatus. Their advantages are cleanliness and portability. The cells last for twelve months if used two or three times weekly ; but even if they are not used they gradually run down. After exhaustion, they are of no further use and new cells must be installed.

The portable batteries provided by the electro-medical instrument-makers consist of a box in the interior of which are packed the dry cells. On the top of the box, under the lid, are fixed : (1) A ' cell-collector ', i.e., the device for increasing or diminishing the strength of the current ; (2) A milliampèremeter, for measuring the strength of the current ; (3) A commutator, for reversing the current ; (4) Two terminals, marked + and − respectively, for attachment of the conducting cords which lead the current to the patient.

1. *The Cell-collector.*—By means of this device, as many cells as desired can be included in the circuit, and in this way the strength of the current passing to the patient can be regulated. The cell-collector consists of a circular plate of ebonite, around the periphery of which are secured a number of metal studs. Pivoted on a pin at the centre of the disc is a crank. When the crank is rotated, its free end makes contact with the studs, one after the other. The cells are all joined together in series ; that is, the zinc of the first cell is connected to the carbon of the second, and the zinc of the second to the carbon of the third, and so on. This leaves a free carbon, or positive pole, at the beginning of the series, and a zinc, or negative pole, at the end. The free carbon, or positive pole, is attached to the first stud, which is marked O, and also to the + terminal from which the current is taken. A wire is brought from the junction between the first and second cells to the next stud, which is marked 1, and so on all the way round—the zinc or negative pole being joined to the last stud, which is marked 32. The pin upon which the crank is pivoted is joined to the negative terminal. The crank must make contact with one stud just before it leaves another, but care must be taken not to leave it in contact with two studs for any length of time, as this would short-circuit one cell and rapidly exhaust it. The crank should offer a slight resistance to movement, and slide round smoothly, making light but sure contact with each stud as it passes. When the patient is connected to the terminals marked + and −, rotation of the crank from the stud marked O to that marked 1 brings the first cell into the circuit. Rotation of the crank from stud 1 to stud 2 brings also the second cell into the circuit. By continuing the rotation, as many cells as desired can be included in the circuit, and the current thereby increased to the strength desired.

A device like that described above, with a single crank, is known as a *single* cell-collector. It is advisable, when choosing a battery, to select one with a *double* cell-collector, This is provided with an additional crank, but in other respects it is similar to that just described. The disadvantage of a battery with a single collector is that the first few cells are always used with every application of the current, while the last cells are used only when the strongest current is required. Hence the first cells are exhausted soonest and so interpose a useless resistance to the current when the other cells are used. When a double collector is fitted, any cell or group of cells may be used. This collector has an extra movable crank, similar to the other. It is mounted on the same pivot, but insulated from it, and from the other crank. It is connected to the positive terminal and to the stud marked O. When the cranks are placed on any two adjacent studs, the current from a single cell is taken to the terminals. By separating the cranks further, any group of cells can be brought into the circuit. By means of the double collector different cells can be used on different occasions.

2. *The Milliampèremeter* measures the current in thousandths of an ampère—the milliampère being the unit of current for medical treatment. Those fitted to modern batteries are of the moving-coil type. They read accurately in any position, and the pointer quickly comes to rest when a current passes through them. The zero should be at the centre of the scale, so that the pointer can move to either side and therefore indicate the direction in which the current is passing. Usually the scale is divided into 15 parts each side of the zero, each division corresponding to a milliampère. As it is frequently necessary to measure more than 15 ma., a device is fitted whereby only a known fraction of the current can be passed through the instrument when desired. By moving a handle or disc fitted to the metal case, only one-tenth of the current which the patient is receiving passes through the milliampèremeter. This device is known as a ' shunt '. When the shunt shows the figure 10, the figures on the scale must be multiplied by 10 in order to know the current passing to the patient. If the figure 1 is shown, then the whole of the current received by the patient passes through the milliampèremeter, and the figure on the scale opposite the

pointer is the actual value of the current passing through the patient. When the figure 0 appears, it means that the instrument is out of circuit. In some instruments, the figures on the shunts indicate the maximum current that can pass to the patient when the pointer is at the end of the scale. Thus, if the figure 150 appears on the shunt, 15 on the scale indicates, not 15, but 150 milliampères.

The milliampèremeter requires careful treatment. After use, the shunt should always be placed at zero. Under no circumstances should the ends of the conducting cords, which take the current to the patient, be brought into contact. If this is done, and any cells are included in the circuit, a very strong current will pass through the milliampèremeter (the resistance of the body being now excluded), and the instrument may be damaged.

3. *The Commutator* reverses the current, when desired. There are different patterns of commutator, but all have a handle which can be moved to one side or the other, which are marked N (normal) and R (reverse) respectively. When the handle is opposite N, it means that the two terminals of the battery are + and −, exactly as they are marked. If moved to the side marked R, the plus terminal becomes minus or negative, and vice versa.

4. *The Terminals*, to which are connected the conducting cords which lead the current to the patient, are marked + and − respectively. When the reverser is at N and the current passed through the patient, the pointer of the milliampèremeter should move to the *right*. If it moves to the *left* the operator will know that the current is flowing in the opposite direction, and that the terminal marked + is now —, and vice versa.

Conducting Cords (*rheophores*).—These should be flexible, and the insulating covering should be waterproof. The best forms are made of stranded copper wire provided with stout metal tips for attachment to the terminals of the battery and electrodes. They are enclosed, except at their extremities, by rubber tube, which insulates them and renders them waterproof. They can be obtained from instrument-makers.

Electrodes.—These serve to lead the current into and out of the body. For application to the skin, they are made of sheet brass cut to the size desired. When the surface to which they are to be applied is uneven, as, for example, around the ankle, copper gauze is better, as it is more pliable and can make more even contact than is possible with sheet metal. Chain-mail electrodes are more pliable than copper gauze. Connection between the conducting cords and copper gauze can be made by means of a safety pin with a terminal soldered to the latter. The conducting cord is attached to the terminal, and the safety-pin is passed through the gauze. The brass plate and chain-mail electrodes are provided with terminals for attachment of the conducting cords.

Metal electrodes are never placed in direct contact with the skin (except under special circumstances), but are separated from it by layers of lint, cut to a slightly larger size than the metal. A folded towel may be used in place of the lint. The lint or towel should be soaked in dilute salt solution (two teaspoonfuls of salt to a pint of hot water). When the galvanic current is used, the lint or towel pads should be never less than half an inch thick. If they are thin, there is a risk of blistering the skin. There is not this risk with the faradic current. Special electrodes are used when the currents are to be applied to less accessible regions, such as the rectum, colon, uterus, etc. These will be described later.

Warm water is a very useful electrode for the extremities. The hands or feet can be immersed in bowls made of non-conducting material. For the forearms or legs, the Schnee bath receptacles are useful. A metal or carbon conductor is hung over the edge of the bowl or receptacle so as to dip into the water to the bottom of the vessel without touching the skin of the part immersed. The water makes a perfectly fitting electrode, and the parts immersed are kept warm. More current enters the region at the surface of the water than elsewhere.

Path of the Galvanic Current through the Body.—The current passes *into* the body by way of the electrode connected to the *positive* pole of the battery. This electrode is called the *anode*. The electrode by which the current passes *out of* the body is connected to the *negative* pole and is known as the *kathode*. Having passed through the skin, the current does not travel solely along the direct path between the electrodes. Wherever there is conducting tissue the current travels, but the longer the path the smaller the fraction of the whole current that passes along it. The major portion of the current travels along the direct path between the electrodes, because this path is the shortest. The amount of current per unit of cross-sectional area of the path of the current is known as the *density* of the current. The density is greatest in the region of the electrodes. It rapidly diminishes as the distance from the electrodes increases. In the outlying regions, away from the parts directly between the electrodes, the density of the current is so small that it has probably no therapeutic value. If, therefore, it is wished to apply the current to a deep-lying part, the electrodes shall be placed, not side by side, but on opposite aspects of the body, so as to include between them the part requiring treatment. This applies to other currents as well as the galvanic.

Regulation of the Galvanic Current.—Except in the applications in which it is made to flow momentarily or intermittently (for purposes of stimulation), the galvanic current should never be applied suddenly. It should be slowly and gradually increased from zero, a few milliampères at a time. While the current is flowing, the resistance of the skin falls gradually to its minimum value. The pointer of the milliampèremeter continues to move for a short time even though the crank of the cell-collector is stationary. While the current is spontaneously increasing, the crank must not be moved. Only when the pointer comes to rest may more cells be included in the circuit.

The maximum current which the skin can tolerate, with safety, is 1·5 ma. per each square centimetre of electrode. It is better, at the first application, to use only 1 ma. per square

centimetre. After the current has passed for the desired period, it should be reduced to zero with the same slowness as that with which it was increased.

B.—Source of Faradic Current.—The current is obtained from an induction coil. The construction and mechanism of the induction coil will be familiar to many practitioners; and others will find descriptions in any book on medical electricity.

Two currents can be obtained from the induction coil, one from the primary winding, the other from the secondary winding. Both are interrupted currents, and the frequency of the interruption corresponds to the rate of vibration of the interrupter. The primary current flows always in the same direction; the secondary is an alternating current. Both possess the power to stimulate the tissues, especially the *motor* nerves. They therefore cause contraction of muscle, and they are chiefly used for this purpose. If they stimulate the sensory nerves as well, a disagreeable and painful sensation will accompany the contraction. The currents from different coils vary greatly with regard to the pain which they cause. It is therefore advisable to use one which will give a current causing as little discomfort as possible. Modern coils are designed especially for this purpose. The design of the interrupter is of much importance. If the hammer moves in a *vertical* plane, it will vibrate unevenly and the current will be irregular and cause pain. It should vibrate in a *horizontal* plane. If its rate of vibration can be adjusted, and reduced to as low as one or two per second when desired, an additional advantage is gained.

The coils which are fitted to the portable combined batteries give currents which do not produce painless contraction; some are fitted with a rod and ball which can be fixed to the vibrating hammer so as to add inertia to the latter and enable an adjustment of the rate of vibration. It is a better plan, when selecting apparatus, to get a battery containing cells only, and choose a different coil. A very useful coil is that known as the 'Physio'. It is fitted with a 'see-saw' interrupter which can be adjusted so as to vibrate any number of times per second between 1 and 60. The secondary current can be taken from one or more of its four divisions, so that voltage of the current can be varied according to the resistance of that part of the body through which it is to be taken. Finer variation can be effected by sliding the secondary over the primary, on special runners provided for the purpose. The current causes contraction of muscles without pain. Another coil which is very useful for causing rhythmic contraction is the 'Smart-Bristow' coil. Its chief feature is the method adopted for regulating the strength of the current. The regulation is effected by sliding the iron core in and out of the primary coil. A fine rhythmic variation of the current can be produced, and, with it, a rhythmic contraction of the muscles. The frequency of interruption is not adjustable, except within narrow limits.

There is no instrument, suitable for routine use, for measuring the strength of the faradic current. The operator must trust to his own or to the patient's sensations when administering the current. Some coils, such as the 'Physio', are provided with a scale so as to indicate the position of the secondary over the primary coil. If this position is noted, the same strength of current can be repeated on other occasions.

Electrodes like those for use with the galvanic current are also suitable for the faradic current. Metal discs, padded with lint or flannel, are often used. A set of these, containing 4 sizes, ¾ in., 1 in., 1½ in., and 2 in. in diameter, may be obtained. The size required for use can be screwed on to a wooden handle, provided with a terminal for attachment of the conducting cord.

The statements made regarding the path of the galvanic current through the body are true also for the faradic current.

II.—THERAPEUTIC ACTION AND PROPERTIES OF THE GALVANIC CURRENT.

Much more is known now than formerly regarding the method of action of the galvanic current in the treatment of disease. To understand it, a knowledge of the meaning of the term 'ion' is necessary. When salts, acids, or bases are dissolved in water, a certain proportion of the molecules divide or dissociate into two parts, and each part acquires an electric charge. These electrically-charged parts are known as 'ions'. The more dilute the solution, the larger the number of ions and the smaller the number of undissociated molecules. The soluble saline constituents of the body, being in dilute solution, are mainly in the ionic state. So also are salts, acids, or bases when dissolved in water and used for internal or external medication. The ability of the tissues to conduct electric currents is due to the presence of ions. Substances such as albumin, sugar, etc., which do not form true solutions, exist in water in the molecular, not in the ionic state, and do not conduct the low potential electric currents used in medicine.

When a galvanic current is passed through a solution, containing ions, by way of two poles dipped into the solution, the ions begin to migrate along the path of the current. The ions with the positive charge migrate away from the positive pole towards the negative pole. The ions with the negative charge migrate in the opposite direction, away from the negative pole, towards the positive pole. When the ions reach the poles to which they are attracted, they lose their electric charges and become free atoms. The latter undergo further chemical change. Thus the sodium ion, which carries a positive charge, is attracted to the negative pole. On reaching it, it gives up its charge and free

sodium is formed. This decomposes the water and forms caustic soda and hydrogen. The chlorine ion, which has a negative charge, is attracted to the positive pole. On reaching it, it gives up its charge and free chlorine is formed. This decomposes the water and forms hydrochloric acid and oxygen. Two phenomena therefore accompany the passage of the galvanic current through the solution containing the ions—viz., a migration of ions in the region *between* the poles, and a formation of new chemical products *at* the poles. Similar changes take place when a galvanic current passes through the tissues. If the positive and negative poles are placed on the skin and the current started, the ions in the tissues between the poles begin to migrate, and new chemical products begin to form where the poles make contact with the skin. These new chemical products (acid at the positive pole, alkaline at the negative pole) can be made to accumulate in sufficient amount to destroy the skin. They can be formed in any region where the poles can be placed and used to destroy abnormal tissue. The galvanic current is therefore able to cause destruction of tissue by reason of its power to cause accumulation of caustic chemical products at the poles where it enters or leaves the tissues. This method of treatment is known as 'surgical ionization', or 'electrolysis'. The advantages peculiar to this method are that the caustic can be exactly localized to the spot desired, that its formation is under complete control, and that the process is antiseptic. In the section headed Surgical Ionization will be found a description of the application of the method and the diseases which can be successfully treated by it.

The migration of ions along the path of the galvanic current through the body is attended by therapeutic results, although the precise relation between the latter and the movement of the ions is not known with certainty. It is possible that foreign ions possessing toxic properties are formed in disease: if so, the current would cause their migration, and all those that passed through the walls of capillaries and lymphatics would be carried away by the circulating fluids. The maladies which can be treated by the galvanic current, in which the mode of action of the current is obscure, will be mentioned in the section dealing with the treatment of disease in deep-lying parts.

There is, however, another use which can be made of the galvanic current, in which the mode of action of the current is much more clearly understood. The power of the current to cause migration of ions can be utilized for the introduction of ions possessing therapeutic properties into the body. This form of treatment is known as 'medical ionization' or 'ionic medication'. If a pad, soaked in a solution containing the ions, is placed on the skin, and the current made to traverse it on its way through the body, then the ions in the pad will migrate, just as those in the tissues migrate, and those possessing the same charge as the pole connected to the pad will pass from the latter, through the skin, into the body. For a certain distance below the surface every cell and intercellular space is permeated by the ions. The uniformity and completeness with which diseased tissue can thus be subjected to the action of therapeutic substances by the ionic method are equalled by no other.

Medical ionization is, however, of doubtful value for the treatment of parts which lie more than a few millimetres below the surface. Ions migrate slowly, and in the time usually allotted to one treatment, say 20 minutes, it is unlikely that they pass in further than 3 or 4 mm. Increase of the length of the treatment will not appreciably increase the depth of the penetration, because capillaries and lymphatics are encountered below the epithelium, and ions which penetrate the walls of these vessels are carried away. An ion cannot penetrate far without meeting a capillary or lymphatic. Further, many ions, especially those of the metals, form insoluble compounds with the tissue proteins or with other ions in the tissue fluids, and therefore cease to exist in the ionic state and pass no further. The therapeutic results which follow the passage of the galvanic current through deep-lying parts which are the seat of disease, are not due to the new ions which have entered for a short distance below the surface. The galvanic current is used empirically for the treatment of disease in parts beyond the range of accessibility of ions introduced through the skin, and clinical experience has shown the diseases which can be successfully treated. The method of performing medical ionization and the diseases which may be treated by it will be found in the section headed Medical Ionization.

The galvanic current can produce other changes in the tissues, and these changes may play some part in the treatment of disease. The current can cause a gradual passage

of water from the positive towards the negative pole. Tissues under the positive electrode therefore become less moist, while those under the negative electrode become more moist. This phenomenon is known as 'electric osmosis' or 'kataphoresis'. It was formerly confused with ionization.

The galvanic current is able to produce certain physiological changes in the tissues. How far these changes play any part in the treatment of disease is uncertain. It is known that the excitability and conductivity of excitable tissues are altered by the passage of a galvanic current through them. In the region of the anode the excitability and conductivity of a nerve are diminished (anelectrotonus), and the conductivity may be even abolished, while the current is flowing. In the region of the kathode the reverse alterations take place (katelectrotonus). In the body pure anelectrotonic or katelectrotonic effects cannot be obtained, because the nerves lie surrounded by conducting tissues, and the poles cannot be placed in direct contact with them because the skin and underlying tissues intervene. Under the anode, the region of the nerve in closest vicinity to the pole is in a condition of anelectrotonus, but on the opposite side of the nerve, where the current is leaving it, there is a virtual kathode and a condition of katelectrotonus. As the lines of flow of the current diverge after entering the body, the anelectrotonus is more concentrated than the katelectrotonus, so that the excitability and conductivity are lessened rather than increased. The reduction of pain and spasm by the galvanic current in the region of the anode may be due to the formation of anelectrotonus.

Dilatation of the blood-vessels is another phenomenon that occurs during the passage of the current. It can be readily observed in the skin, where an erythema is produced, more marked under the anode. Vasodilatation probably occurs in the subcutaneous tissues also. The additional supply of blood to a diseased part may, under certain conditions, aid the process of healing.

The current is also able to cause a migration of bacteria when in suspension in fluid containing ions. The organisms move to the anode, and, on reaching it, are destroyed by the chemical products that form around the pole. An example of the utilization of this property of the current in treatment is seen in Russ's method of removing the gonococci from a chronically inflamed urethra.

A.—**Medical Ionization.**—The use of the galvanic current for the *introduction of ions into the tissues* should be restricted for disease in superficial regions. Inflammation of the skin or mucous membranes, with or without ulceration, can frequently be healed after all other methods have failed. To perform medical ionization, lint pads, not less than half an inch thick, are applied to the part requiring treatment. They should have previously been soaked in a 2 per cent solution of the drug containing the ions which are to be introduced. They are covered by metal sheet or gauze, to which is attached the conducting cord from the battery. These electrodes have already been described in the section dealing with apparatus. To complete the circuit, a similar electrode, but larger in size, and soaked in salt solution, is placed on another convenient part of the body. The amount of current to be used, and the regulation of the current, have been described before.

It should be remembered that the ions of metals and of alkaloids bear a positive charge. If positive ions are to be introduced, the pad containing them is connected to the positive pole of the battery. All other ions have a negative charge. Further details of application of ionic treatment will differ slightly according to the region and the local condition. These will be described below.

Chronic Septic Ulcers can usually be made to heal by ionization. After removing any discharge or crusts, the ulcer should be filled with portions of cotton-wool until it is made level with the skin ; 2 per cent zinc sulphate solution should be then dripped on the wool till the latter is saturated, and then the lint pad, similarly soaked, is placed in contact with the wool. The pad should be slightly larger than the ulcer. The current should be passed for fifteen minutes. No further ionization should be performed until ten days have expired. If healing begins, no further application is necessary unless the healing process comes to an end. If zinc ions fail, the ions present in a solution of iodine in potassium iodide (1 per cent of each) may be used. This solution contains, besides the iodine ion, another ion with an iodine atom or atoms of which the formula is unknown. It has a strong germicidal action. If iodine ions are used, the treatment can be repeated twice weekly.

Indolent Ulcers and Wounds, without evident sepsis, can often be made to heal by chlorine ions, if no foreign body or particle of dead bone is present in the edges or base.

Syphilitic Ulcers may be ionized, using the iodine solution above mentioned. This treatment seems to accelerate healing when antisyphilitic drugs are administered.

Tuberculous Ulcers can sometimes be made to heal by zinc or iodine ions. If tuberculous nodules persist in scars remaining after partial healing has been effected by *x* rays, zinc ions should be applied after the nodules have been denuded of their epithelium by liquor potassæ.

Sinuses can sometimes be made to heal after ionization with zinc. Success can be expected only when the sinus is straight and of relatively uniform width, and has no side channels or lacunæ. A zinc rod, covered with a thin layer of cotton-wool, is passed into the sinus. If the latter is very narrow the bare zinc rod may be used. From 5 to 10 ma., according to the width of the passage, for every inch of zinc rod inserted, should be given. The treatment should last ten minutes, and should be repeated not less frequently than once every ten days.

Chronic Infection of the Cervix or Body of the Uterus or of the Vagina can often be brought to a permanent end by zinc or copper ions. To ionize the mucous membrane of the cervix or body of the uterus, the vagina should be kept patent by a perforated glass speculum. A copper or zinc sound is placed in the canal of the cervix, and, if necessary, in the cavity of the uterus also. If the vaginal portion of the cervix is also inflamed, some solution of zinc or copper sulphate should be placed in the upper end of the vagina (the patient lying on her back) so as to cover the cervix. The metal rod should be covered by rubber tube, except at the portion in the uterus and the portion in contact with the solution covering the cervix. If copper or zinc is placed in contact with moist tissue and connected to the positive pole, ions of the metal will be formed and migrate inwards. The acid which forms around the positive pole dissolves the metal and forms a salt, which dissolves and so forms the ions.

The vaginal wall can be ionized by distending the channel with solution of zinc or copper sulphate. Special apparatus is required for this operation.

Inflammation and Ulceration of the Rectum or Colon should be treated by *zinc* ions. To ionize the rectal wall, a special electrode is used. It is made of a wire spiral enclosed in a rubber tube with perforated walls. The rubber is enclosed in a bag made of animal membrane, inserted into the rectum for the greater part of its length, and only a short portion is left extruding from the anus. The rubber tube is connected to a cannula containing a solution of zinc sulphate. The solution is passed through the tube. It then passes through the side openings of the tube and distends the membrane bag, bringing the latter into apposition with the rectal wall. The current passes along the wire spiral to the solution and through the membrane bag into the wall of the rectum. Ions of zinc migrate in the same direction. For the colon, a longer electrode is used and the membrane bag is not attached. The solution is slowly passed along the tube into the rectum and colon so as to distend it gradually. Chronic proctitis can often be cured by zinc ions, and rectal ulcers sometimes healed. Treatment of mucous colitis by zinc ions reduces the frequency of the motions and lessens the mucus.

Rectal Fissure can usually be healed by zinc ions. The sphincter should be slightly distended so as to obliterate the skin folds, and a narrow zinc rod, covered at its end with cotton-wool, is moistened with zinc sulphate solution and placed in the fissure. A preliminary application of local anæsthetic is usually necessary.

Trachoma, purulent keratitis, and Mooren's ulcer of the cornea have also been treated successfully by zinc ions.

Skin Diseases.—Treatment by the ionic method has not been given an extended trial in cutaneous affections. For the small flat multiple *warts* seen on the back of the hand, and on the face, magnesium ions are, in some cases, extremely effective, one application often causing them to disappear. In obstinate cases of *sycosis* and *acne* some successful results are obtained with zinc or salicylic ions.

Scar Tissue and Adhesions.—Chlorine ions possess the power to soften scar tissue and loosen adhesions. The cause responsible for the formation of the scar tissue must disappear before treatment is commenced; otherwise the action of the ions will be counteracted and success will not be attained. The best results are seen in superficial scars.

This sclerolytic action of the chlorine ions is slow and gradual. It can be hastened by applying heat (particularly diathermy) before ionization, and passive movements afterwards. This combined treatment is successful in some cases of joints which possess a limited range of movement due to injury of the soft tissues. It is sometimes successful for Dupuytren's contraction of the palmar fascia.

Peripheral Neuritis.—Salicylic, quinine, and iodine ions are often introduced by the ionic method for the treatment of peripheral neuritis accompanied by pain. Good results are often obtained, but it is improbable that the ions reach the inflamed nerve-trunks. Some of them will enter the nerve-endings in the skin, but many workers claim equally good results when sodium or chlorine ions are used. One electrode should be placed over the inflamed nerve-trunk in the region which is tender on pressure. This electrode may be soaked in 2 per cent sodium salicylate. The other electrode, soaked in salt solution, is placed on the forearm or leg. If the brachial plexus is inflamed, one electrode should be placed so as to overlie the supraclavicular fossa and adjoining regions. To ensure uniform contact, without uneven pressure, this electrode may be made of layers of Gamgee tissue. It is soaked in 2 per cent solution of sodium salicylate. The other electrode is placed around the forearm. For sciatica, the electrode soaked in salicylate should be placed on the region which is tender on pressure. The other electrode should be placed on the leg. This treatment may be applied in early acute cases, even when the patient is in bed, and in these it may, with advantage, be repeated every day. If repeated daily, the current should be weaker, not more than $\frac{1}{4}$ ma. per square centimetre. In chronic cases the current may be the usual strength and applied on alternate days.

B.—**Galvanic Treatment of Disease in Deep-lying Regions.**—The use of the galvanic current for treatment of disease of those parts which lie deeply below the skin and cannot be reached by ions introduced from the surface will now be considered. Since we do not know precisely the method by which the current brings about cure or relief of maladies of deep-lying regions, we cannot predict the diseases which are likely to yield to the current, and must therefore rely on experience gained in the past. The galvanic current may be used, with benefit, in the following diseases and symptoms.

Arthritis.—

1. Traumatic arthritis.—Much good can be done to joints, which have been inflamed as the result of injury, by the galvanic current, both in the chronic and acute stages. Pain is relieved and effusion reduced. Two electrodes should be used, and placed on opposite sides of the articulation so as to direct the current through the joint; where possible, it should be directed anteroposteriorly on one occasion, laterally on the next. Care must be taken that the edges of the electrodes do not touch or approach too closely. If the case is one of long duration, and scar tissue and adhesions have formed, the galvanic current may be used for its sclerolytic power. As already stated, the action is slow, and can be quickened by heat and passive movements.

2. Gouty arthritis.—This can frequently be relieved by the galvanic current. The introduction of lithium ions does not seem to be more effective than the passage of the current by itself. In the acute stage of gouty arthritis the galvanic current is not used.

3. Rheumatoid arthritis and osteo-arthritis.—These are occasionally benefited to a slight degree, when the disease is quiescent. When there is much pain and stiffness, little relief can be obtained.

4. Gonococcal arthritis.—This can often be relieved by the galvanic current if the disease has not progressed to the stage in which much fibrous tissue has formed or bony changes have taken place.

Neuritis.—A method of applying the current for treatment of the pain accompanying neuritis has been described above. As already stated, the therapeutic results are more likely to be due to some other action of the current than to the entry of special ions.

Neuralgia.—Trigeminal neuralgia has in some cases been diminished in severity, and the paroxysms lessened in frequency, by the galvanic current. A few apparent cures have been reported. To apply the current, the following method may be employed. An electrode of sheet lead is cut roughly to the shape of the letter E. Sixteen thicknesses of lint are cut to the same shape and well moistened. The upright part of the E is placed along the side of the face, while the horizontal parts are placed along the forehead, cheek, and chin respectively, the lint being, of course, between the metal and the skin, and the

former is connected to the positive pole of the battery. The negative is connected to a plate which hangs in a foot-bath filled with warm water, in which the patient's feet are immersed. The current is to be turned on and increased very gradually, until from 30 to 50 ma. are passing, and continued from twenty to thirty minutes. It is then reduced in the same gradual way, and the whole process repeated daily until the tendency to the paroxysms disappears. In some cases the electrode has been saturated with a 1 per cent solution of quinine hydrochloride: in others with a solution of sodium salicylate of the same strength. In these cases there is an entry of ions. When salicylic ions are used, the active electrode must be connected to the *negative* pole.

Raynaud's Disease.—The pain, the severity, and frequency of the paroxysms can be reduced by the galvanic current. The best way to apply it is to fix the negative electrode (kathode) over the spine in the region of the dorsal or lumbar enlargement of the cord, according to the extremities affected, whether hands or feet. The anode is connected to a vessel containing warm water in which the hands or feet are immersed. A current of 20 ma. is passed for twenty minutes. It is doubtful whether cures have been effected by the galvanic current, but many cases are relieved, and the patients always feel better after the treatment.

Cerebral Galvanism.—Some cases of mental fatigue, cases in which the patient is quickly tired by brain work and is unable to concentrate or remember recent events, are benefited by passing the galvanic current through the brain. The kathode is placed on the forehead, the anode on the back of the neck. The current should not exceed 8 ma. during the first application, and it should be increased very slowly to this strength. It should flow for fifteen minutes, and then be reduced to zero with equal slowness. Some cases of neurasthenia derive relief if this treatment is administered, in conjunction with general treatment.

C.—**Surgical Ionization (Electrolysis.)**—It has already been mentioned that the new chemical products, which the galvanic current causes to accumulate at the poles, where the latter make contact with the ions, can be used for the destruction of tissue. This method of treatment possesses the advantages that the destruction can be exactly and minutely localized to the spot desired, and that antisepsis is secured. Those surgical applications of the galvanic current which can be carried out with the portable battery as the only source of energy are not very numerous. It is not wise to use such a battery for treating a large nævus, for instance. The large current required would quickly exhaust the small cells composing it, and the current might fail for this reason before the operation was complete. There are certain cases, however, occasionally met with in general practice which can be dealt with quite satisfactorily, and the operations are easy to perform.

Removal of Superfluous Hairs.—For this, a good light is essential. The indifferent electrode—anode—is placed under the palm. The other pole is connected to a holder which bears at one end a platinum-iridium needle. This needle should not be thicker than $\frac{1}{5}$ mm., and its end should be rounded—not sharp. Make-and-break keys and magnifying lenses, which are fixed to some holders, hamper rather than help the operation. If the operator has defective eyesight, a good plan is to wear spectacles fitted on one side with a magnifying lens. Myopia is advantageous for electric epilation.

Each hair has to be treated separately, and when a large surface has to be done, it is better to remove hairs from every part, and not from one spot. About twenty is the largest number that can be treated at a single sitting, and if these were removed from one spot, a troublesome ulcer would very likely result.

The needle is passed into the follicle, the hair acting as a guide for the direction of the passage. Some operators find it easier to insert the needle if the hair is gently pulled by the epilation forceps. The patient now places her hand on the indifferent electrode. The current is started, and increased till the milliampèremeter indicates 2 ma. Slight effervescence is seen at the orifice of the follicle. After five to ten seconds the needle is withdrawn and the hair is removed by the forceps. It should come out without any resistance. If it resists, the needle should be re-inserted and the current resumed for a few seconds. For the next hairs, the current regulator should stay in the same position, and the patient should lift her hand off the indifferent electrode till the needle is inserted. When the needle is in position the patient replaces her hand on the electrode so as to

complete the circuit and allow the current to flow. The same process is repeated for each hair.

The success of this little operation requires practice, patience, and skill. The needle should not be too sharp ; a rather dull point finds its way along the follicle more surely and easily. Platinum or platinum-iridium needles should always be employed, and should be sterilized in the flame of a spirit-lamp before use. There is a stinging pain while the needle is in the follicle, but it is never so severe as to require a local or general anæsthetic. Under the most favourable conditions a few of the hairs return, and have to be removed at a future time.

Moles.—These, when occurring on the face, constitute a disfigurement which the possessors are usually glad enough to be rid of, if it can be done easily and without severe pain. If small in size and hairy, epilation as above may be all that is necessary. After the hairs are removed, the pigmentation disappears to a large extent, if not altogether, and the mole shrinks in size. Remaining pigment can be destroyed by transfixing the tissue with a zinc needle and passing a current of 2 ma. for one minute. The process is repeated, transfixing the tissue in various directions, till all is destroyed. Destruction occurs for about a millimetre around the needle. The zinc needle is described below under NÆVI.

Nævi.—These are sometimes met with in general practice, especially in infants, and when under an inch in diameter can be successfully treated with the current from small battery cells. Such work tends to exhaust the latter rather rapidly, but it is generally worth doing, and the cells are easily replaced. The object is to break up the blood-vessels and coagulate the blood therein, without causing general necrosis of the mass and consequent sloughing. It is important to know when to stop. If the growth is subcutaneous, the skin is not disturbed, except at the minute openings where the needles are inserted ; but if the skin also is involved in the growth, some scarring is unavoidable. The pain is severe, and an anæsthetic is always necessary with children, and also in many cases occurring in adults.

For very minute capillary nævi, or nævi of which the component vessels are larger and separated from each other, or for telangiectases, a single needle may be used. It should be made of zinc wire, $\frac{1}{24}$ in. thick, and tapered to a fine point at one end. The point is inserted so as to transfix the vessels, and a current of 1 ma. is passed for one minute. The tissue for a small area around the needle is whitened and cauterized. The process is repeated in adjacent vessels till all are destroyed. The zinc needle is connected to the *positive* pole. The acid which is formed in contact with the zinc combines with the latter and forms zinc salts, chiefly the chloride. These dissolve and zinc ions are formed. The latter migrate into the tissue immediately around the needle. They are sufficiently concentrated to exert caustic action. Similar action is exerted by the zinc chloride which begins to accumulate around the needle.

Occasionally nævi of a stellate form are met with, where all the vessels composing it seem to radiate from a central vessel. If the needle is inserted in this vessel for one minute, the whole will probably disappear. The indifferent electrode is placed on the sternum or other convenient part, and a current of 1 ma. is passed for one minute, after inserting the needle for $\frac{1}{6}$ in. into the central vessel.

For cavernous nævi it will be found more satisfactory to employ the bipolar method. For this we require the special bipolar needle devised by Dr. Lewis Jones (*Fig.* 28). In this, the two wires from the battery are joined to the two terminals on the holder, and the internal connections are such that the needles are positive and negative alternately. Two, three, four, or five needles may be employed, according to the size of the mass to be treated. Three are about as many as can be used when working from the cells of a portable battery. The needles are pushed into the nævus. The current is started, and gradually increased. It should not exceed 20 ma. for each inch of *positive* needle inserted.

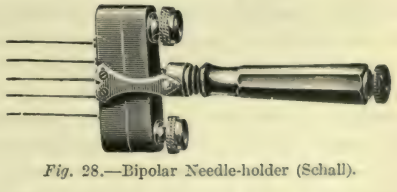


Fig. 28.—Bipolar Needle-holder (Schall).

Soon after the needles are inserted the tissues around them begin to change colour. At the positive needle there are hardening and pallor, and the needle itself tends to become

fixed and difficult to withdraw. Round the negative there is frothing from evolution of hydrogen gas, and the needle gets quite loose. The tissues become dark, livid, and boggy, and when this occurs the needles should be partially withdrawn, and re-inserted in different directions from time to time, until the whole mass is broken up, and the blood in the vessels more or less completely coagulated. If the nævus is entirely subcutaneous, these changes are less easily seen, but an indication of the sufficiency of the treatment is afforded by a change in the consistency of the nævus. It gradually becomes firm; and gentle pressure, which was sufficient, before treatment, to empty the nævus, is no longer able to obliterate it. The aim should be to destroy the growth as far as possible at the first operation. This is easy enough when the nævus is not more than $\frac{1}{4}$ in. in diameter. If larger than this, two or more operations will be necessary.

The after-treatment is quite simple. In most cases a piece of antiseptic gauze is secured over the punctures by means of flexible collodion. If sloughing should occur, an antiseptic poultice is applied until the slough separates, and the ulcer is treated on general principles.

It should be remembered that the treatment of large nævi requires currents which will exhaust small dry cells very quickly, so that the cells so used may have to be renewed before the rest of the battery is used up. For treating these large nævi it is better to use a battery of large cells; but the method is described here, since it is possible to use the smaller cells found in portable batteries.

Warts.—These can easily be destroyed by transfixing them at the level of the skin by a zinc needle. A current of 1 ma. is passed for one minute. The wart becomes paler during the flow of the current, and separates or shrinks away after seven to ten days. If the wart is thicker than $\frac{1}{8}$ in., it should be transfixed in two directions at right angles. Flat warts cannot be treated by this method on account of the difficulty of passing the needle.

Papillomata of the Skin.—These can be destroyed in the same way as warts. They must be transfixed in many directions.

The electric cautery is, of course, not an instrument for electric treatment. The part played by electricity is merely that of a convenient means of heating the burner. The large currents required for this purpose are far beyond the capacity of a battery of dry cells. They can be obtained from accumulators. Bichromate cells could be used.

III.—THERAPEUTIC ACTION AND PROPERTIES OF THE FARADIC CURRENT.

The most important property of the faradic current is its power to stimulate the excitable tissues, particularly motor nerves. It is therefore able to cause contraction of voluntary muscle. Sensory nerves can also be stimulated by the faradic current, and it is probable that, in consequence, many or all parts of the body are reflexly stimulated. Involuntary muscle is also stimulated, but the excitation is subminimal and no evident contraction is produced.

The faradic current is chiefly used for the treatment of paralysis. Its therapeutic properties in this condition are not due entirely to its power to cause contraction of muscle; if the latter shows the reaction of degeneration, the faradic current is unable to cause it to contract; but it is nevertheless able to hasten recovery and to relieve some of the symptoms which may accompany paralysis—viz., cyanosis, trophic sores, and other results of defective circulation.

The faradic current is applied in the same way as the galvanic, and similar electrodes are used. The extremities may be immersed in water in porcelain or china bowls, or the Schnee bath receptacles may be used. Since the faradic current causes the muscles to contract, it is necessary to introduce into the circuit some device which will rhythmically interrupt the current. The muscles will therefore relax during the periods when the current is not flowing, and fatigue, which would be caused by continuous contraction, is prevented. Apart from the prevention of fatigue, currents which are rhythmically interrupted produce better results than those which flow continuously. This is an important general principle, and it is true of all currents used for the purpose of stimulation, whether the muscles contract or not.

Rhythmic interruption of the faradic current can be produced by sliding the secondary coil to and fro over the primary. The secondary coil is moved over the

primary till the sensation perceived by the patient is as strong as can be borne without discomfort : it is then moved off until no sensation is perceived. About two seconds should be spent in each movement. An alternative method is to include a metronome interrupter in the circuit, and regulate the rate of swing so that the current flows for about two seconds and is interrupted for the same period. Another method is to apply the current by way of an electrode which is considerably smaller than the region requiring treatment. This electrode, which is a padded metal disc, is stroked rhythmically over the part and lifted off at the end of each stroke. This method is suitable for regions such as the face, foot, etc., where the accurate application of electrodes is tedious and less easy.

Treatment of Paralysis.—In treating paralyzed muscles, a general rule is to use the faradic current if the muscle will contract to it, but if not, the constant current will be found preferable. As the muscle improves under this, the coil can be brought into use to complete the cure, so far as such a result is possible. A further point worthy of attention is that the kathode, or stimulating pole, should be the active electrode in treating paralysis with the constant current, the anode being placed over the nerve-trunk or cord, according to the seat of the lesion. All forms of electrical stimulation are of use in the treatment of paralytic conditions, and as the induction coil in some form is everywhere obtainable, there is no excuse for not using it.

The current should be rhythmically varied and interrupted by one of the methods described above. One electrode is placed over the paralyzed muscles, and the other is placed in a position so that the current can pass through the region which is the site of the lesion, when known. Treatment should last not less than fifteen minutes, and should be repeated daily when possible ; it should not be given less frequently than twice weekly.

Care should always be taken to prevent passive stretching of paralyzed muscles, not only when applying treatment, but also in the intervals between treatment. When a group of muscles is paralyzed, and their antagonists are normal, the electrical stimulation of the former may cause the latter also to contract, and the paralyzed group may be stretched. This may be prevented by placing both electrodes over the paralyzed group so as to localize the current more closely to the affected muscles. If very strong currents are necessary, the normal muscles will contract in spite of this precaution. Under these circumstances, the stretching of the paralyzed muscles can be prevented by fixing the joint which the muscles move, by means of a suitable splint.

Facial Paralysis.—A disc electrode, 1½ in. in diameter, should be stroked rhythmically over the affected side of the face, starting from the region of the mastoid, and passing towards the centre of the face over the various muscle groups in succession. The current chosen should be that which causes the muscles to contract. If, therefore, the muscles react normally, the faradic current should be used ; if they show the reaction of degeneration, the galvanic current should be applied. The active electrode should be the anode. The indifferent electrode should be placed on the palm.

Paralysis of the Hand or Foot Muscles.—These muscles should be treated in the same way as the facial muscles. The indifferent electrode should be placed over the region of the lesion. If the latter is unknown, the indifferent electrode should be placed on the palm or sole.

Paralysis of the Forearm or Leg Muscles.—The forearm or leg may be immersed in water in Schnee receptacles or in vessels of similar size and shape. If one group of muscles only is paralyzed, the application of the current to the immersed limbs may cause contraction of the healthy muscles and stretching of the paralyzed group. If this occurs, the limbs must be removed from the water and electrodes applied over the affected group.

Paralysis of the Thighs or Upper Arms.—The limbs should be extended and the electrodes applied over the paralyzed group.

Paralysis of Shoulder or Trunk Muscles.—A disc electrode, two or three inches in diameter, should be stroked rhythmically over the affected muscles. The indifferent electrode should be placed on some convenient situation of the trunk, so that the site of the lesion, when known, is included on the path of the current. When the lesion is near the paralyzed muscles, the disc electrode should be moved over the region of the former as well as over the muscles.

Paralysis of Sphincters of Rectum or Urethra.—The active electrode should be a metal

rod. For the urethra, a bougie may be used as the electrode. For the anal sphincter, a metal rod half an inch in diameter should be used.

Infantile Paralysis.—Electrical treatment of paralysis due to anterior poliomyelitis requires great patience and perseverance. Treatment for six months on alternate days is the minimum necessary. It is not worth while commencing electrical treatment if the patient or parents of the patient are not prepared to persevere with it. On the other hand, long-continued treatment will always bring about some improvement even in the worst cases. Improvement is relatively quick at first; afterwards it is slow, but treatment should be continued for six months after improvement appears to have come to an end. Daily treatment will produce quicker results than treatment on alternate days.

One of two methods may be adopted. The patient may be placed in a bath made of non-conducting material, such as porcelain or wood. He should be in a sitting posture, and the water, suitably warmed, should reach to the shoulders. Metal plates, hung over the edge of the bath and immersed in the water, should be used as electrodes. One is placed at the foot end, the other on the head end. The back should not touch the latter electrode. The faradic current should always be used in preference to the galvanic current in baths. This form of treatment does not cause contraction of muscles showing reaction of degeneration, and if the current is so strong as to cause disagreeable sensation to the patient, normal muscles do not contract either. The treatment, nevertheless, will bring about improvement, wherever improvement is possible, and no case is so bad that no improvement can be produced. The current stimulates the peripheral sensory nerve-endings in the skin, and in this way the spinal centres and the organs at the periphery are influenced. If the upper extremities are paralyzed, the water should cover the shoulders, and the arm should be supported in a horizontal position. This form of treatment has been applied for many years to cases of infantile paralysis in the Electrical Department of St. Bartholomew's Hospital, and the best results are obtained. The sinusoidal current is used in place of the faradic; this current, also, produces no contraction of the muscles when applied in a bath.

In the absence of a bath, the following method should be adopted. The patient lies on his back on a large pad wrung out of hot saline, large enough to cover the whole back. Another electrode is applied to the foot so as to surround it completely. The current is directed between these electrodes. The faradic current is used if the muscles react normally. It is interrupted rhythmically by a metronome. If the muscles show the reaction of degeneration, the galvanic current should be used. This current should be interrupted, and, in addition, reversed after each interruption. This interruption and reversal can be effected by a reversing metronome interrupter.

It is very important that the affected limb should be kept warm, not only during treatment, but in the intervals between treatment. Cold greatly retards recovery.

Hemiplegia.—Cases of paralysis due to lesions in the upper motor neurone sometimes improve under electrical treatment. Many patients are convinced that they gain strength and freedom of movement in their limbs, and occasionally the improvement is manifest to the practitioner. The degree of improvement possible will, of course, depend on the amount of damage done by the lesion, and, if the latter is progressive, little or no improvement can be expected. Electrical treatment may be tried for cases of paralysis following cerebral hæmorrhage or thrombosis, and injuries to the head, after the necessary medical or surgical treatment has been applied. A rhythmically varying faradic current should be applied from arm to arm, and from leg to leg. The parts may be covered by electrodes or immersed in water in suitable baths. The current should not cause strong contraction of the paralyzed muscles.

Treatment of Other Affections.—

Chilblains.—The faradic or galvanic current can usually effect a cure of this troublesome complaint. The current may be applied to the hands and feet in the same way as that described for treatment of paralysis of the muscles of these parts. A quicker way is to immerse the hands or feet in water in suitable bowls, and direct the current, rhythmically varied, from one to the other. To conduct the current to the water, a metal strip can be bent over the edges of the vessel so as to dip into the water, in such a position that the current can traverse the whole of the immersed part. If any of the

hilblains are 'broken', they should be covered by strapping. If there are large sores, gentle galvanic current should be allowed to flow without interruption. This will aid healing.

Aphonia.—See under HYSTERIA.

Constipation.—Many cases of obstinate constipation can be cured by means of the faradic current. One electrode, a metal rod half an inch in diameter, is placed in the rectum. The other, a padded disc two inches in diameter, is pressed on the abdomen, held there for a couple of seconds, and then removed for the same time. This process is repeated continually, and the electrode is gradually shifted so as to follow the course of the large intestine. The treatment should last fifteen minutes, and be repeated daily at first, and less frequently afterwards as improvement continues. The rapidly interrupted faradic current should be applied. If the frequency of the interruption can be varied, it is a good plan, after commencing with a current which produces tetanic contraction of the abdominal muscles, to lower the frequency of the interruption to once per second and so produce single contractions. A stronger current can be applied if the frequency of interruption is slow.

Fibrositis.—When adhesions are formed after inflammation of the fibrous connective tissue and aponeuroses, and pain is caused by movement, relief can often be obtained by applying the faradic current, the interrupter adjusted so as to vibrate once per second. The active electrode should be a padded disc one inch in diameter. It is moved over the area in which pain is felt. The muscular twitches will be found to cause much pain when the electrode is in certain situations. The electrode should be kept in these situations, successively, and the contractions repeated. It will be found that the pain gradually lessens and finally disappears. The patient then feels only the muscular contractions. This treatment should be repeated daily. On subsequent applications, the patient may be able to tolerate stronger shocks. The treatment is aided by a preliminary application of heat to the painful area, before applying the current.

Hysteria.—Hysterical *paralysis* can be treated successfully in many cases by the faradic current. The movements which the patient cannot perform are produced artificially by the current, and the patient is encouraged to perform them herself. Hysterical *anæsthesia* may also be treated by the faradic current. A fine wire metal brush should be used, and stroked over the anæsthetic area. The general hysterical state, as well as the above-mentioned symptoms, can be effectively treated by static electricity; the machine in operation has a powerful psychic influence on the patient. Hysterical *aphonia* can be treated by applying sudden strong faradic stimulation to the front of the neck over the larynx, by way of a small disc electrode. The other electrode is placed on the back of the neck. The object should be to make the patient cry out or scream. If this can be done, the patient recovers her voice.

Insomnia.—A few cases can be benefited by general faradization. The results of electrical treatment are very uncertain. If general faradization fails, the patient should be treated by simple charging from the static machine, if the blood-pressure is low; if it is high, general diathermy should be tried.

Neurasthenia.—The general medical treatment of this condition should always be instituted. Electrical treatment by itself rarely effects a cure. While the general treatment is being conducted, some help may be derived from electrical methods. Cerebral galvanization may be applied. The general condition of the patient is improved by the static breeze applied to the spine and scalp. This treatment should be given when the blood-pressure is low—as is frequently the case in neurasthenia.

Incontinence of Urine.—When this is due to weakness of the sphincter, the urethral sphincter should be stimulated, as described under PARALYSIS. When the incontinence is nocturnal, the act of micturition taking place involuntarily during sleep, the patient should be treated by the faradic current. One electrode, a padded disc three-quarters of an inch in diameter, should be moved over the perineum. The other should be placed over the region of the lumbar enlargement of the spinal cord. Strong currents must be used. It is necessary in most cases to apply the galvanic current as well. This current is rhythmically interrupted and reversed once per second. This interruption and reversal can be effected by means of the reverser fitted to the galvanic battery.

Obesity.—The faradic current can be used for the treatment of this condition. By

its means the muscles are made to contract against resistance and perform work. Th subject reclines on a set of electrodes attached to a chair, while other electrodes are place over and held in position with sand-bags—the latter also acting as a load for the muscle to work against. Current impulses pass between the electrodes in such a way as to caus the principal muscles to contract rhythmically and in regular order. The result is tha the patient performs a large amount of work without mental and with little bodily fatigue Weight is rapidly reduced, and so far the results have been very satisfactory. Necessaril the apparatus is both costly and extensive, and the method scarcely comes within th province of the general practitioner. It is free from most of the dangers that occasionall follow the use of drugs and vigorous dieting; the treatment can be obtained at som watering-places, such as Harrogate and Bath, and in some private institutions. Thi treatment and the necessary apparatus were introduced by Bergonié.

General Faradization.—Electrical stimulation of the whole body is conducted, in th electrical departments of hospitals and in private institutions, by means of the hydro electric bath, using the sinusoidal current. General electric stimulation is also performe by means of the faradic current, without using a bath. The treatment is indicate for patients suffering from poor general health, who complain of depression, lack o appetite, sleeplessness, and minor ailments. It is conducted in the following way. Th patient stands or sits on a large metal plate, which is covered by moist flannel, and i necessary kept warm by a hot-water bottle. One of the conducting cords from the coi is attached to this plate, and the other cord to the active electrode, which may be one o the ordinary circular discs, covered and wetted in the usual way. This latter is sometime held by the operator in one hand, while he uses his other hand as the active electrode It is worked over the head, neck, back, abdomen, arms, and legs, in this order, giving from two to four or five minutes to each. It is not necessary to remove the underclothing and the current should not be so strong as to give discomfort to the patient. Th immediate effect is a comfortable sense of well-being, with relief of fatigue. With a course of this treatment, both appetite and sleep improve, and there is a general return to normal condition.

In hospitals and some private institutions, the sinusoidal alternating current is used to procure general stimulation of the body, in the electric bath. The full-length bath is more effective than the Schnee bath; in the latter the limbs only are immersed. This current is also an effective stimulant of the nerves and muscles in the treatment of paralysis, especially infantile paralysis. It also possesses analgesic properties, and is effective in further relieving pain accompanying neuritis after the acute stages are over.

IV.—HIGH-FREQUENCY AND DIATHERMY.

Treatment by high-frequency is the application of an electric current which is made to alternate at an exceedingly high rate, a million or more times per second. Currents which alternate with this frequency lose their power to stimulate the tissues to give their customary physiological response, and they are unable to produce chemical (electrolytic) changes. Nerves are not stimulated and muscles do not contract. These currents are, nevertheless, able to modify some of the physiological processes of the body, and they possess therapeutic properties. For many years there was no satisfactory explanation why high-frequency currents were unable to stimulate muscle or nerve, even when their strength was far greater than the maximum which could be tolerated in the case of other currents. Their use in medicine was empirical; a vast number of maladies were treated, and the results obtained by different workers varied considerably, while many were of the opinion that all the effects which followed treatment by high-frequency were due to 'suggestion'. During recent years it has been realized that these currents owe their properties mainly, if not entirely, to their power of generating heat within the body. A current which cannot stimulate tissues or produce electrolytic changes can be passed through the body and raised to a strength far greater than is possible with other currents. When the strength is sufficiently great, heat is generated, precisely in the same manner that any conductor traversed by a strong current is heated. Part of the electric energy is converted into heat, in overcoming the resistance which the conductor offers to the current. The outcome of this discovery was the construction of a machine capable of generating far stronger high-frequency currents which were able to produce heat sufficient

be felt by the body and recorded by a thermometer. The original high-frequency machine gave currents which produced, at most, a trifling sensation of heat. The heat which is generated by the electrical current is distributed along the path of the current. When the current traverses the body, not only the skin but also the underlying organs are heated. Treatment by modern high-frequency machines is known as *diathermy*. The new term is used in recognition of the heat which the current produces and the distribution of the heat *throughout the tissues*, not merely its confinement to the skin. Other methods of applying heat to the body raise the temperature of the skin only.

The principle upon which high-frequency currents are generated may be briefly described. If a condenser, such as a Leyden jar, is charged and then allowed to discharge along a thick wire spiral of low resistance, the current accompanying the discharge, though of extremely brief duration, will alternate at an exceedingly high rate between the coats of the jar, along the wire spiral. The current will, in fact, be a high-frequency current. If, however, the discharge takes place along a circuit of high resistance, such, for example, as the body, the current will not be oscillatory, but flow in one direction only.

In the original type of high-frequency machine, two Leyden jars are used as condensers. They are charged from a large induction coil capable of giving a 6- or 8-in. spark. They discharge along a spiral of thick copper wire, known as the 'solenoid'. The terminals of the coil are attached to the inner coats of the jars; the solenoid connects the outer coats. Directly the jars are charged, they discharge, and the high-frequency current alternates along the solenoid.

The reason why the current from the original type of high-frequency machine is unable to generate more than a trifling amount of heat is the fact that the group of oscillations, accompanying each discharge of the jars, lasts only for an exceedingly brief time, say $\frac{1}{50000}$ of a second. The coil is unable to charge the jars often enough to allow groups of oscillations to follow each other without intervals of rest. In other words, the oscillations are not 'sustained'. In the original type of high-frequency machine, the periods of rest are far longer than the periods occupied by the groups of oscillations, and very little heat is generated, because the current is flowing for so short a proportion of the time during which the machine is working.

The modern diathermy machine generates a high-frequency current on the same principle as that described, but various modifications are made in its design. The condenser, made of metal plates separated by layers of insulating material, is charged, not from a spark coil, but from a static transformer connected to the main current. The latter must be an alternating current. The condenser is charged at a more rapid rate than are the Leyden jars attached to the spark-coil, and the groups of high-frequency oscillations which accompany the discharges follow each other without intervening periods of rest. The oscillation is therefore sustained, and the current is able to produce a much larger quantity of heat.

The original high-frequency machine can be modified so as to yield an appreciable degree of diathermy, and the diseases for which diathermy is indicated may in some cases be treated by the modified high-frequency machine. The original machine, or its modification, can be used for the production of what is known as the 'high-frequency effluve'. This is a form of brush discharge. The voltage of the current is raised to a very high value by connecting the solenoid to the coil of wire wound on a circular wooden cage. This coil is known as the 'resonator'. If an electrode composed of a metal disc bearing a large number of fine wire bristles is connected to the end of the resonator and held near the body, the discharge takes the form, not of single sparks, but of a brush. If the brush is directed on to the skin, it gradually produces an erythema, and, if the application is prolonged, blisters may be produced. Instead of the metal brush, the so-called vacuum electrode may be used. This consists of a glass tube from which air has been sufficiently exhausted to make it a fairly good conductor. If this electrode is placed on the skin, a large number of fine sparks pass continuously between the latter and the glass. The skin is quickly heated and an erythema is produced. The sensation is that of a prickly heat. The spark discharge causes the formation of ozone and oxides of nitrogen from the atmospheric gases. These new products are formed also in the horny layer of the skin. The sebaceous glands are stimulated, and the glass is gradually covered with their dried secretion.

A.—**Medical Uses of High-frequency Currents.**—Treatment by 'high-frequency' is usually understood to mean the passage through the body of the current from the earlier type of machine, without the accompaniment of sparks or brush discharge. It is questionable whether the currents of relatively low ampèrage (0·5 or 0·6), when applied to the whole body (*general* high-frequency treatment), have much therapeutic value. The heat generated is too small to be felt or measured. When machines yielding larger currents are used and perceptible heat is generated, the treatment is more correctly called 'diathermy'. The maladies for which diathermy is indicated are mentioned below.

Uses of High-frequency Effluve and Spark Discharges.—The chief use of the effluve is for the relief of *pain*, especially that accompanying inflammation of peripheral nerves, fibrous tissue, and muscles. Cases of sciatica, brachial neuritis, lumbago, etc., will sometimes derive relief when the galvanic current is ineffective. When tenderness

of the skin is not acute, the current may be applied by means of the vacuum electrode. The latter is more effective in some cases. Others derive additional benefit if the high-frequency is combined with massage. The combined treatment may be applied by placing the patient on an insulating platform and connecting him to the top of the resonator by way of an electrode grasped in the hands. The operator massages the painful parts. Heat is soon perceived by patient and operator in the parts massaged.

The application of the vacuum electrode is often very effective in the treatment of *acne* and *eczema*. The ozone and oxides of nitrogen which are formed during the spark discharges, particularly from the vacuum electrode, have strong germicidal properties, and they may contribute to the production of the effects. When the diathermy current is applied by means of the vacuum electrode, these gases are formed in larger quantity and more heat is felt, while there is less irritation of the skin. Cases of acne and eczema seem to yield more quickly when the electrode is connected to the diathermy machine than when it is connected to the resonator of the high-frequency apparatus.

Indolent ulcers and *wounds which are slow in healing* can be stimulated by the discharge from the vacuum electrode connected to the diathermy machine.

B.—**The Uses of Diathermy.**—The current from the diathermy machine can be used for two purposes : (1) Parts which are the seat of disease can be raised to a temperature insufficient to destroy them or impair their vitality ; this is known as *medical diathermy*. (2) The temperature of the tissues can be raised to a degree sufficient to coagulate and destroy them ; this is known as *surgical diathermy*. The latter treatment is used for the destruction of new growths, both innocent and malignant, and infective granulomata.

1. Medical Diathermy.—All the maladies which are benefited by the application of heat are benefited by diathermy. In addition, the power of diathermy to raise the temperature of the deep as well as the superficial tissues enables results to be obtained which are impossible when heat is applied to the surface. The following diseases and morbid conditions are especially suitable for treatment by diathermy, if simpler methods of treatment fail to effect cure or relief.

a. Patients who suffer from *a feeling of constant cold and inability to keep warm* frequently derive permanent benefit from diathermy. These patients often suffer in addition from various symptoms such as dyspepsia, loss of appetite, depression, sleeplessness, or undue fatigue on exertion, and their temperature is usually subnormal. Such patients are apparently unable to produce sufficient heat for their bodily functions. For them diathermy supplies the heat which the body cannot produce. These patients lose their symptoms when treated by general diathermy, and gain weight. The improvement is lasting. Old people who complain of cold derive much benefit from diathermy.

b. Acute pain due to *neuritis* is frequently relieved by diathermy. The best results are obtained in relatively recent cases. The relief lasts usually for a few hours after the first treatment, but subsequent applications are followed by relief for longer periods, and eventually the pain is either permanently removed or reduced to a slight degree.

c. Patients with symptoms due to or accompanying *high blood-pressure* will sometimes derive great benefit from general diathermy. It is possible by general diathermy to lower abnormally high blood-pressure ; but relief of symptoms is often obtained even though the blood-pressure may not be reduced, and care must be taken not to lower the pressure below that which is necessary to secure a sufficient supply of blood to the parts in which the vessels are sclerosed. Cases of very advanced arteriosclerosis are less suitable for treatment by diathermy than those in which the vessels are less hard. Patients suffering from cardiac pain or angina are sometimes relieved by application of diathermy to the heart muscle by way of an electrode placed over the heart.

d. Gonococcal infection of certain regions can be successfully treated by diathermy. If the temperature of its surroundings is raised slightly above normal, the organism is destroyed ; 102·2° is said to be the minimum lethal temperature. If, therefore, an infected part be heated throughout to this temperature, it can be freed from the organism.

Cases of *gonococcal arthritis* are relieved of pain and swelling, and if bony change or much thickening of the extra-articular fibrous tissue have not taken place, the joint may return to its normal condition.

Gonococcal orchitis and epididymitis respond well to diathermy. Pain and swelling

re quickly relieved. Cases of *gonococcal endocervicitis* have been rendered free from the rganism. The permanence of the effect is under trial. The female urethra has also een freed from the gonococcus. The treatment of the male urethra is more difficult. A ethod is now under trial.

e. Cases of *paralysis agitans* derive considerable benefit from general diathermy, lthough the effects are not permanent. Improvement for periods of six or nine months an be obtained. The best results are seen in patients over 50.

f. The pain and spasm caused by *hæmorrhoids* can be relieved by diathermy applied o the rectum and anal canal. The relief is maintained after the course of treatment complete, sometimes for several months. The treatment does not obliterate the æmorrhoids.

2. Surgical Diathermy.—The heat produced by the diathermic current can be aised to a degree sufficient to coagulate the tissues *in situ*. The treatment is used for he destruction of new growths, both innocent and malignant, and for certain infective ranulomata. The necessary temperature is produced, not merely by increasing the trength of the current, but by increasing its density. If the current is passed through he growth by way of a very small electrode placed on or within the new tissue, while the ther electrode, one of large surface, is placed on a distant part of the body, the density f the current and the heat generated will be greatest in the growth and least in the region f the indifferent electrode. The tissue in contact with the active electrode and for a ertain distance around will be raised to a temperature sufficient to coagulate it *en masse*.

The advantages peculiar to this method of treatment are the following. The growth s destroyed without loss of blood, and the small blood-vessels and lymphatics are sealed. he operation is not followed by shock, and the discomfort of the patient is slight or bsent. These advantages render treatment by diathermy particularly suitable for nalignant growths, even when they are too advanced for excision.

Malignant Growths.—If a growth is to be treated by diathermy it must be within each of the active electrode, since the latter must be placed in contact with it. Growths f the skin, and of the mucous membranes of the mouth, tongue, pharynx, larynx, sophagus, rectum, bladder, and cervix uteri, have been treated. If the growth has nfiltrated into regions which cannot be destroyed without danger, diathermy cannot e applied—at any rate, with the expectation of procuring a long period of relief, without ecrudescence. If the patient has lost weight and cachexia is present, diathermy is not ikely to procure benefit. The presence of enlarged glands is no contra-indication to iathermy, if cachexia is absent.

Up to the present time, diathermy has been used mainly for inoperable malignant rowths, more particularly of mouth, tongue, tonsils, pharynx, and larynx. Freedom rom symptoms such as pain, bleeding, discharge, and salivation has been obtained in a rge number of cases for periods of some months, and life has been prolonged in some ases for a year, two years, or even longer. In cases in which the growth has not spread ar, treatment by diathermy will undoubtedly prolong life further. The quickness of he operation, the absence of shock and freedom from disagreeable symptoms during onvalescence, and the very short stay in bed, indicate the use of diathermy for very early ases. If the growth is quite small, a local anæsthetic only is necessary.

For *rodent ulcers*, diathermy is particularly effective. Even if bone and cartilage re invaded, the malignant process can be sometimes stopped, as these tissues can be asily cauterized to any desired depth by diathermy. If the ulcer is very extensive and in close vicinity to important structures, the progress of the ulceration can be delayed y diathermy. Cases of less extensive ulceration which have resisted all other methods f treatment have been made to heal by diathermy, and in one case no recrudescence as occurred after six and a half years.

Non-malignant Growths.—Treatment of *papillomata of the bladder* by diathermy is ow widely adopted, and the method will probably secure permanent freedom from appearance. Cases have been kept under observation for six years and there has been o return of symptoms, smooth scars marking the site of the former growths.

Nævi can be successfully removed by diathermy. The method is most suited for ævi of the mucous membranes. They can be destroyed at one sitting, even if they are rge and pulsating. For nævi of the exterior, diathermy should be reserved for those

in which other methods of treatment, such as surgery, electrolysis, or radium, have failed or are thought inadvisable.

Diathermy should be tried for *fibromata of the nasopharynx*. These usually bleed profusely when attempts are made to excise them with the knife. One case has been treated by diathermy and the growth was permanently removed, without bleeding.

Warts and *papillomata of the skin and mucous membranes* can be quickly and permanently removed by diathermy. No anæsthetic is required.

Pigmented areas of the skin and *port-wine stains* have also been successfully treated by diathermy.

V.—STATIC ELECTRICITY.

The modern static machine is a large and costly apparatus, and it requires much attention. The machine, in operation, has a strong psychic influence on many patients which aids, but is by no means entirely responsible for, the production of therapeutic effects. It can give a powerful brush discharge, which, when applied to the skin, especially that of the scalp and spine, stimulates the sensory nerve-endings and causes a reflex rise of blood-pressure. *Headache* associated with low blood-pressure is frequently relieved by it, and debilitated subjects are invigorated. The brush discharge is a useful accessory treatment of *neurasthenia* in patients with low blood-pressure. Applied to the spine and loins of young patients suffering from *amenorrhœa*, it frequently restores menstruation, if no pelvic or organic disease is present. Applied in the same way to patients who have no organic disease of the uterus, it will sometimes relieve *dysmenorrhœa*. It should be applied daily for a week before the onset of the next period.

By means of the static wave current or static sparks, strong rhythmic twitches or tugs of muscle can be effected. The static wave current causes very little pain. The rhythmic muscular twitches act mechanically, and loosen adhesions following inflammation of muscles and fibrous tissue. In conditions like *lumbago* this form of treatment is frequently beneficial. The static sparks cause more violent tugs and are more painful. Some cases of chronic *neuritis* and *sciatica* are relieved by the static wave current or sparks.

E. P. Cumberbatch

ELEPHANTIASIS.—(*See* Filariasis.)

EMBOLISM, CEREBRAL.—(*See* Apoplexy Hemiplegia.)

EMPHYSEMA.—The treatment of chronic emphysema is of necessity confined to the alleviation of symptoms and complications, and to hindering the progress of the disease.

General and Preventive Treatment.—Chronic bronchitis, with recurrent acute attacks, is most frequently responsible for the increase of emphysema (*see* Bronchitis, Chronic).

Occupations which predispose to bronchitis are obviously unsuited to emphysematous patients; in addition, any laborious pursuit is disadvantageous in that it throws an extra strain both on the lungs and heart. Stair-climbing and exercises of the like character are best avoided.

Climatic treatment is often of the greatest assistance, but cannot always be afforded. The means of the patient and the cause of the emphysema must be carefully considered before a change of residence is advised. For instance, it is well known that the personal experience of an asthmatic patient is the only trustworthy guide to a suitable climate.

Speaking generally, the climates best suited to emphysematous patients have a high barometric pressure, are free from wind and dust, are warm and somewhat moist. The country should not be too hilly, and the position of the house should be carefully chosen. In this country many places on the south-west coast are quite suitable; for instance, Bournemouth, Torquay, Falmouth, Penzance, St. Ives, Lyme Regis, etc. Abroad, Egypt suits many, especially Assouan, which is relatively free from dust, and the desert itself for those who can afford to camp out. Luxor is often intolerably dusty, and the powdered Nile mud unpleasant both to the lungs and nose. Cairo is not a health resort, and is unsuitable. Algiers, both at Mustapha and on the desert edge at Biskra, is fit for cases that are not very far advanced.

The French Riviera has a very treacherous climate; the cold wind from the hills nd the hot sun make it dangerous. The Italian Riviera—Nervi, Rapallo, Santa Margarita —has a much more agreeable climate, and some good hotels may be found there. In icily, Taormina and Palermo are both good wintering places. If a moister climate seems esirable, Madeira, Teneriffe, or Las Palmas may be recommended.

It must not be forgotten that some emphysematous patients who owe their trouble o spasmodic asthma are more comfortable in London than elsewhere, in spite of, r perhaps because of, the fogs.

Drug Treatment.—It is doubtful if any drug treatment can have an influence on the egenerative changes which take place in the lung tissue; yet long experience makes it ertain that patients feel more comfortable while taking certain medicines. If there is ny tendency to gout, arterial degeneration, or asthma, potassium iodide in intermittent ourses of two or three weeks is often of value :—

℞	Potassii Iodidi Ammonii Carbonatis	āā gr. iij	Potassii Bicarbonatis Aquæ Camphoræ	gr. xv q.s. ad ℥j

Thrice daily after meals.

To this mixture liquor arsenicalis 3 min. may be added, or if there is any tendency o spasm of the bronchial tubes, 5 to 10 min. of the tincture of belladonna. If there is næmia, and in some cases where there is renal degeneration, the addition of iron is seful :—

℞	Potassii Iodidi Ferri et Ammonii Citratis	gr. iij gr. xv	Potassii Bicarbonatis Aquæ Pimentæ	gr. xv q.s. ad ℥j

Thrice daily after meals.

Some emphysematous patients are stout; in these cases, if the kidneys are sound, reatment of the obesity by diet and regulated exercises with massage is of great value. The article on OBESITY should be consulted. Other emphysematous patients are thin; ere the dietetic treatment should be like that for tuberculosis. The food should be lentiful and contain much fat; the administration of cod-liver oil, with or without malt xtract, is generally helpful. If the oil is distasteful, one of the many proprietary prepara- ions or substitutes may be used in its place.

Compressed Air.—Emphysematous patients are at times undoubtedly benefited by course of compressed-air baths. Unfortunately, there are very few places where they re available in this country. At the Brompton Hospital a small iron room has been so rranged that the air pressure within can be gradually raised while the supply of fresh air s abundant; the patient is placed in the chamber and the pressure is gradually raised, ntil after twenty minutes it equals ¾ to 1 atmosphere; the air remains at this pressure or one hour, and is then slowly decompressed. While the patient is in the bath he feels elieved, and after a course of twenty or thirty baths the relief is found to be persistent. The treatment is unsuitable if there be obesity, chronic kidney disease, arterial plethora, tendency to hæmoptysis, etc.; and in some patients subject to asthma, exposure to he pressure seems to determine an attack. Apparatus for the inhalation of air under ressure and exhalation into rarefied air are useless.

Complications.—Bronchitis and cardiac failure with pulmonary congestion and œdema re the most common complications of emphysema. The treatment of these conditions s discussed in the articles on BRONCHITIS, and CONGESTION, PULMONARY. *Cecil Wall.*

EMPYEMA.—When by the aid of the exploring syringe the presence of an empyema as been definitely proved, the treatment resolves itself into that indicated in the case f any other collection of pus, namely, the provision of free, unhindered drainage.

Satisfactory drainage of the pleura can be secured only by means of an opening large nough to admit a full-sized drainage tube, and for this purpose removal of a portion of ne or more ribs is necessary. It may, however, be wiser, in certain circumstances, either o aspirate an empyema or to make a simple incision into it.

1. **Aspiration.**—Although an empyema has undoubtedly been cured on a few rare ccasions by one or more aspirations, the chance of cure in any given case is so remote, nd the importance of freeing the lung as soon as possible from compression by the fluid so great, that it is unwise to aspirate except as a preliminary to some form of drainage.

If the empyema is a large one and the patient is much distressed, and especially if t heart is displaced, aspiration should be performed forty-eight hours before the chest opened. The general condition of the patient is by this means greatly improved, so th an anæsthetic may safely be given and the chest opened without anxiety. Again, wh the heart is displaced, experience has shown that sudden evacuation of a large quanti of pus, resulting from a free opening into the chest, may be exceedingly dangerou numerous instances of fatal syncope having occurred under these circumstances. Tl danger will be avoided by aspiration, the slow withdrawal of part of the pus allowing t heart to return gradually to its normal position without risk. If it be decided to attem aspiration for either of the above reasons, the needle used must have a large bore, in ord to guard, as far as possible, against the liability to blocking.

2. **Incision** is suitable in certain cases, namely (*a*) Those in which the patient is ill that it is important to do what is necessary as quickly as possible, and without disturbi the patient more than is absolutely necessary ; (*b*) Where aspiration is indicated but h failed owing to the thickness of the pus ; (*c*) Those in which a general anæsthetic cann be given or is not available ; and (*d*) Where the character of the assistance available, a the circumstances of the case, necessitate the adoption by the practitioner of the simple and quickest method of treatment that is likely to be successful.

The patient should lie on the back or to a slight extent rolled on to the sound sid with the side to be operated upon projecting well over the edge of the bed or table. Tl skin of the chest-wall having been painted with 2 per cent solution of iodine in rectifi spirit, and all necessary precautions having been taken to preserve strict asepsis, the si of the incision must be decided upon. If the empyema involves the whole chest, tl incision should be made in the seventh intercostal space immediately in front of tl posterior axillary fold, i.e., at the anterior border of the latissimus dorsi. If the empyen is a small localized one, the presence of pus at the dullest part must be verified with a exploring syringe, and the incision made at this spot. The site of incision should now l infiltrated with novocain solution, a 1 per cent solution being used for the skin, and per cent solution for the deeper tissues. The upper edge of the rib forming the low boundary of the intercostal space selected is now fixed with the finger nail, and the point the knife having been placed upon the skin immediately above the finger nail, it is quickl pushed into the chest and rapidly carried along the upper border of the rib for about tw inches. A pair of sinus forceps is now passed along the knife into the chest, the kni withdrawn, the forceps widely opened, the pus allowed to escape, and a drainage tul passed through the incision.

The great disadvantage of this operation is that, owing to the closeness of the ril to one another, the tube is liable to be compressed, and the drainage thereby rendere unsatisfactory. In order to combat this tendency as far as possible, a thick-walle drainage tube should be used, of as large a calibre as the intercostal space will admit, an further, two tubes may be inserted side by side.

Dressings are now applied, and the patient is returned to bed. For details of after treatment see below.

3. **Resection of a Rib.**—This is the operation of choice, and should be adopted in a cases save those mentioned above. The operation is more difficult than incision and take longer to perform, and is therefore a greater tax upon the patient's strength. In addition a general anæsthetic is an advantage, although local anæsthesia, as described above, wil usually suffice, and is associated with less risk. On the other hand, it has many grea advantages over incision ; the chief being that (*a*) The size of the opening ensures fre and continuous drainage ; (*b*) The large masses of breaking-down lymph so often presen can be scooped out, and the time of healing thereby curtailed ; (*c*) A finger can b introduced into the cavity, and its size and shape and the condition of the lung ascertained In many cases, moreover, recent adhesions between lung and pleura may be gentl separated, and a more rapid expansion of the lung thus secured.

The anæsthetic having been administered, the patient is placed in the position already described, the skin is cleansed, and all other preparations are made. In a genera empyema a portion of the seventh or eighth rib immediately in front of the edge of th latissimus dorsi should be removed, and in a localized one a portion of rib over the dullest part should be chosen. The incision, about three inches in length, is made midway betwee

he borders of the rib, dividing everything down to the bone, including the periosteum. With a rugine the periosteum is now carefully separated, first from the outer and then rom the inner surface of the portion of rib exposed, great care being taken not to open the leura prematurely, and to avoid tearing the periosteum lining the subcostal groove and so ossibly wounding the intercostal vessels and causing troublesome hæmorrhage. About ne and a half inches of the rib, thus stripped of periosteum, are now removed by rib shears r bone-cutting forceps.

The intercostal vessels remain imbedded in the periosteum that lined the subcostal roove, and must be carefully avoided in opening the pleura. This is best done by pushing director into the chest through that part of the exposed periosteum that corresponds o the upper border of the rib, a pair of dressing forceps being then passed along the groove f the director and withdrawn widely opened. Through the opening thus made the cavity ay be explored, its size and the condition of the lung ascertained, and any large masses f lymph hooked out with the finger, or with the finger and a lithotomy scoop combined. f the quantity of pus is large, and especially should displacement of the heart be present, t is important not to allow the cavity to empty very quickly, in order to prevent, as far s possible, the danger of sudden syncope.

Hæmorrhage is, as a rule, slight, and quickly ceases; should, however, troublesome leeding take place from a vessel deep in the wound where ligature is impossible, a pair f Spencer Wells' forceps may be applied and left in position for twenty-four hours. If n intercostal vessel be found to be bleeding, sufficient rib should be rapidly removed to nable the vessel to be under-run and ligatured on either side of the bleeding point.

The cavity being emptied and all masses of lymph removed as far as possible, dhesions between the lung and parietes, if recent, may with advantage be broken down y the finger, as this will greatly aid expansion of the lung, and thus materially lessen the ime required for healing. The drainage tube must now be inserted. This should be a hort tube of very wide calibre, and should be pushed in only far enough to ensure its inner xtremity being flush with the surface of the parietal pleura. The tube may be fixed for he first few days by means of two silkworm-gut sutures passing one on either side through he wall of the tube and the superficial tissues. Later, when the sutures cut out, the tube ay be replaced by a flanged one held in position by tapes passing round the chest. Abundant *antiseptic* dressings must now be applied and the patient returned to bed.

Should an empyema be present on both sides, the larger collection should be drained, nd the opposite side aspirated as a preliminary to opening and draining a few days later.

Treatment after Operation.—Dressings for the first few days, while the discharge s large in amount, should be changed frequently; later, daily dressing will be sufficient. At the dressings the greatest care must be taken, by strict attention to all the details of urgical cleanliness, to prevent infection of the wound, for only by so doing can rapid onvalescence be established and complications avoided.

Every means must be adopted to increase the patient's strength, and as soon as possible he must be got out of bed, then out of doors, and later if possible to the seaside.

In order to help the lung to expand, deep breathing exercises must be encouraged, nd in children the use of blowing toys will be found helpful.

The tube must be kept in position as long as any discharge continues; the length f time depending largely upon the duration of the empyema before draining, this determining the degree and density of the adhesions which bind down the lung and prevent ts expansion.

If the empyema has been drained without any undue delay after its formation, he lung will usually expand steadily, and the case terminate satisfactorily under the reatment above described; but in neglected cases in which the lung has long remained ompressed by a large collection of pus, it may remain permanently airless and fibrotic fter the empyema has been drained.

If after some weeks of drainage without apparent improvement this state of affairs s suspected, the size of the cavity should be carefully estimated at regular intervals by neans of a probe passed in various directions. In this way it can be definitely decided whether the lung is slowly expanding or whether the case is at a standstill. In the former ase every effort should be made to increase the rate of expansion of the lung by the use f deep breathing exercises and by encouraging the patient to move about freely in the

fresh air, so as to increase the amplitude of the chest movements. If, however, the lung shows no sign of expansion, some further operation, such as Estlander's operation and its modifications, will become necessary in order to allow the chest wall to fall in and the cavity thus to become obliterated. *F. J. Steward.*

ENCEPHALITIS, ACUTE.—(See POLIOMYELITIS.)

ENCEPHALITIS LETHARGICA.—The cause of this affection, which is obviously, from the anatomical appearances, of an infective nature and of organismal origin, is as yet undetermined. Constipation, which is often observed in the early stages, may be treated by a dose of calomel. Retention of urine, an occasional symptom during the first few days of the illness, may necessitate catheterization. Hexamine, in doses of 10 gr. four-hourly, may be administered at the onset of the illness. No drug has been proved to have a certain effect upon the pathological process. Thus, potassium iodide and arsenic appear to be of no benefit, and the use of the salvarsan substitutes is, it is affirmed, not unattended with risk. Quinine may be administered during the febrile stage with possible advantage. When the somnolence and lethargy are pronounced, a saline purge may be followed by temporary benefit. In those exceptional cases in which neck rigidity and Kernig's sign are well marked, lumbar puncture and the withdrawal of a few cubic centimetres of cerebrospinal fluid, if the intrathecal pressure is found to be increased, may be carried out. Netter is of opinion that in severe stuporose and semi-comatose cases he has seen improvement follow the subcutaneous injection of a few minims of turpentine with the production of a local abscess. Strychnine, administered hypodermically in increasing doses, seems to be of benefit in some cases in which the state of somnolence is unduly prolonged. When restlessness and insomnia are present, the bromides and luminal, the latter in doses of 1 gr. thrice daily or oftener, may prove of service. These drugs are also helpful in the treatment of the irregular movements which sometimes follow an attack of lethargic encephalitis. Veronal, medinal, and other hypnotics may be employed when sleeplessness is a troublesome symptom. The nursing of cases of encephalitis lethargica is a matter of primary importance. *Edwin Bramwell.*

ENDOCARDITIS.—(*See* RHEUMATISM, ACUTE.)

ENDOMETRITIS, CHRONIC.—The pathology of the endometrium is still in a state of confusion. In the past, the term endometritis was loosely applied to many clinical conditions in which we now know the endometrium was not at fault, and this led to indiscriminate curetting and other forms of local treatment which often did more harm than good. We now realize that the endometrium plays a very small part in gynæcological disease. Pathologically, the only form generally recognized is chronic interstitial endometritis, in which the endometrium is thickened from an increase in the stroma, which is the seat of a round-celled infiltration. Chronic interstitial endometritis is the result of a foregoing acute infection such as puerperal sepsis or gonorrhœa. The term chronic endometritis is often applied to the group of cases characterized by great glandular hypertrophy of the endometrium (sometimes called polypoid endometritis and sometimes diffuse adenoma of the endometrium). Occasionally these hypertrophic states are due to circulatory disturbances associated with retroflexion or chronic pelvic inflammation, but usually they exist as an independent disease, the etiology of which is obscure. The endometrial condition, whether the result of a chronic infection or of glandular hypertrophy, is often combined with a general thickening of the substance of the uterus; to this condition the term chronic metritis is applied. Increased menstrual hæmorrhage and discharge, mucous or mucopurulent, are the chief symptoms.

Treatment aims at abolishing or relieving these symptoms. Hot vaginal douches and ergot are not likely to do either. Calcium lactate, given a week before and during the period, is sometimes successful in diminishing the menstrual hæmorrhage. Iron and time cure some cases. When menstrual hæmorrhage is pronounced and does not yield to general treatment, curetting may be tried.

The operation of curetting is carried out as follows: The instruments required are a duckbill speculum, two pairs of volsella forceps, a uterine sound, a set of Hegar's

dilators, a sharp curette, a pair of uterine dressing forceps, and some swabs of sterilized cotton-wool. All the instruments must be carefully boiled, and then placed in a tray or basin of carbolic lotion.

The patient is anæsthetized, placed in the lithotomy position, and kept there by means of a Clover's crutch. The external parts are then shaved, well washed with soap and water, and swabbed over with a solution of corrosive sublimate 1–1000. A douche of the same antiseptic is given, to disinfect the vagina, after which the operation area is draped with sterile towels. A careful bimanual examination should then be made, to determine accurately the condition of the pelvic organs. The cervix is exposed by means of the duckbill speculum, and the anterior lip seized with a volsella, so as to draw it gently down and at the same time to fix it. The uterine sound is now passed to determine the direction and length of the uterine cavity. A No. 4 or 5 Hegar's dilator is then introduced into the uterine cavity. Firm steady pressure will overcome the resistance of the os internum. The rapidity with which dilatation can be carried out will depend on the rigidity or otherwise of the os internum. If much resistance is met with at this point, dilatation must be carried out slowly, each dilator being left in position for a minute or longer. Often by the time No. 12 is reached much of the resistance originally met with has passed away, and the remaining dilators can be passed without difficulty. Unless it is desirable to introduce the finger into the uterus, dilatation may stop after No. 14 has been passed. The curette is now used—a sharp-looped one is the best. It should be employed firmly and thoroughly, so as to scrape the whole of both the anterior and posterior surfaces of the uterus. Sometimes the other hand may be placed with advantage on the abdomen, to steady the fundus of the uterus during the procedure. Thick flakes of mucous membrane generally come away with the curette. In some rare cases, where the tissues above the os internum are very thin, or where the fundal tissues are very soft, the uterus may be perforated ; but this always takes place during the process of dilatation, and not during the curetting. If such an accident should occur, the dilatation must be stopped. When proper antiseptic precautions have been taken, and the interior of the uterus is not actively septic, no untoward symptoms will result.

After the curettage is completed, the vagina should be swabbed out with an antiseptic solution, but it is not necessary to pack it with gauze. As a rule there is little or no discomfort after this operation if the vagina be not plugged. A douche may be given about the third or fourth day after the operation, and repeated once or twice.

Eardley Holland.

ENDOSCOPY.—(*See* Foreign Bodies in the Air-passages and Œsophagus.)

ENTERIC FEVER, including Typhoid and the Paratyphoid Fevers.—(*See also* Specific Therapy.) In most cases of enteric, the diet and treatment of pyrexia will be the same as those given under Fevers, Acute Infectious. But in consequence of the ulceration of the bowel which doubtless occurs in most cases, and may be slow to heal, it is advisable to be cautious during the early convalescence as well as during the acute stage of the disease. Still, caution should not be carried to the extreme of confining the patient to a purely milk diet (*see the article on* Fevers, p. 323). There can be but little doubt that in the past the intestinal ulceration has, in respect of the diet, been held in too great dread. Following Coleman and others, the writer is now in the habit of feeding typhoid patients liberally. When the patient comes under treatment, he is placed on milk (three pints) for twenty-four hours. Then, beginning with cream and lactose, various articles are added to the diet till by the end of seven to ten days the following daily menu is reached : milk, 2 pints ; cream, 1 pint ; lactose, 3½ oz. ; coffee, 1 oz. ; tea, ½ oz. ; bread, 3 oz. ; butter, 1 oz. ; eggs, 3 (raw, or lightly boiled) ; custard, 4 oz. ; rice, 3 oz. ; mashed potatoes, ½ oz. ; apple sauce, 1 oz. On this diet he is kept until the temperature begins to stay near normal and he feels hungry ; then a little boiled fish is substituted for some of the cream ; and gradually the patient is got back on to his normal diet.

The patient's condition must be carefully watched, and it may be necessary to alter or reduce the diet considerably in certain cases and under certain conditions (diarrhœa, vomiting, etc.).

Purges should be avoided, except during the first three or four days of the illness,

when a moderate dose of calomel or castor oil may be given. At a later date it is dangerous to set up anything like vigorous peristaltic action of the bowel. If there is constipation during the febrile stage, and especially if, as is frequently the case during convalescence, the stools are hard, half an ounce of parolein night and morning or an ounce of the following mixture three or four times a day will be found very useful; it serves to keep the motions soft, and so prevent straining:—

℞ Olei Olivæ	℥x	Sodii Bicarbonatis	gr. v
Liquoris Potassii	℥j	Aquæ Destillatæ	q.s. ad ℥xij
Saccharini	gr. iij		

An occasional soap-and-water enema may be necessary in addition. Unless a very experienced nurse is in attendance, the physician should inspect the patient's stools daily, otherwise some of the conditions to be mentioned may be overlooked. If there is diarrhœa, that is, if there are more than five or six stools in twenty-four hours, the ordinary milk and water should be replaced by whey or peptonized milk. The same diet should be adopted if, with only two or three loose stools daily, the milk is not being digested. If the diarrhœa is very frequent or offensive, some antiseptic should be given, such as perchloride of mercury $\frac{1}{3\frac{1}{2}}$ to $\frac{1}{1\frac{1}{6}}$ gr., or 1 drachm of the liquor, resorcin 3 to 10 gr., or carbolic acid 1 to 3 min., or quinine and chlorine mixture.* Turpentine is useful when the diarrhœa is accompanied by tympanites. If there is abdominal pain, 8 to 12 min. of laudanum every three or four hours, with hot fomentations to the abdomen, will usually give relief. Troublesome vomiting is occasionally met with. This is best treated by omitting everything by mouth, except a little water, for twelve hours, and then letting the patient have whey or peptonized milk.

All the antipyretic measures mentioned in the general article, Fevers, Acute Infectious, may be employed in typhoid fever; but children and old people do not bear cold packs or baths well, and baths are contra-indicated when there is peritonitis or hæmorrhage. Baths, cold or warm, may safely be given during menstruation.

Tympanites.—Ice, or a Leiter's coil with iced water, should be applied to the abdomen. Turpentine may be given internally in 5- to 10-min. doses every four hours; or 2½ to 5 min. of the essential oil of cinnamon of the best quality, every two hours. But both these drugs may cause unpleasant symptoms if pushed.

Hæmorrhage.—The writer has tried various drugs, including acetate of lead, turpentine, and adrenalin chloride; but after considerable experience he believes that subcutaneous injections of morphia and ergotine, with ice, or a Leiter's coil with iced water, to the abdomen, and iced-water injections into the rectum, are the best remedies.

Should much collapse follow severe hæmorrhage, subcutaneous injections of two pints or more of sterilized salt solution (1 drachm of sodium chloride to a pint) should be given. The patient's extremities should be wrapped in wool.

Perforation.—The symptoms of perforation are: (1) Sudden abdominal pain, very often, but not always, severe. The pain may be referred to a particular region, especially the right iliac, but not infrequently the patient declares that it is 'all over the stomach'; (2) Pain, in many cases exquisite, on palpating, even gently, one or another region of the abdomen; in most cases it is the right iliac region. In a few cases pain can be elicited only by rectal palpation; (3) Rigidity of the abdominal muscles, especially over the affected viscus, and therefore mostly those of the right iliac region. This is usually accompanied by (4) Immobility of abdominal muscles in respiration.

The presence of these four symptoms justifies the diagnosis of perforation, but not one of them may be marked, even though perforation has occurred. Therefore other symptoms are of importance. They are: (5) A rigor, at the time or soon after the occurrence of sudden pain; (6) Alteration in the condition of the abdomen, usually in the direction of distention, though sometimes it becomes retracted. It is most important that the physician should inspect the abdomen daily, in order that he may be able to

* Forty minims of strong hydrochloric acid are poured on 30 gr. of powdered chlorate of potassium in a 12-oz. bottle, which is filled up gradually with water, the mixture being frequently shaken while the water is being added, so as to absorb the gas as it is evolved. To the solution when made, 24 gr. sulphate of quinine are added. An ounce should be given every three or four hours.

detect slight sudden changes in its appearance ; (7) Increase in the pulse-rate ; (8) A rise, much less frequently a fall, of temperature ; (9) Vomiting, not usually frequent ; (10) An anxious appearance of countenance ; (11) Collapse.

It should be remembered that the symptoms of perforation may occur and persist for an hour or two, then completely pass off ; so that it may be thought that after all the accident has not taken place. In such cases the symptoms are not as a rule severe. Later, the signs of peritonitis set in : abdominal pain, distention, rigidity, repeated vomiting, a frequent thready pulse, an anxious and pinched face. The obliteration of the liver dullness may mean the presence of free gas in the peritoneal cavity ; a condition which is not usually found till some hours after perforation has occurred. Directly the diagnosis of perforation is made, laparotomy should be performed, unless the patient is in too collapsed a condition to stand the operation, which must in that case be put off till he rallies. The writer has operated on several cases, and believes the following remarks may be useful to other practitioners :—

As time is of great importance, everything should be ready. This can easily be ensured in a hospital. In private practice Dr. Hector Mackenzie's suggestion is a good one, that the medical attendant shall have made an arrangement whereby he can secure the attendance of a surgeon ready to operate at the shortest notice.

The operation can be performed under a local anæsthetic.

Generally the most useful incision is one in the right iliac region (through the linea similunaris if it can be hit off readily) ; but if there is any reason to suspect that the perforation is not in the lower portion of the small intestine, then the incision should be in the middle line below the umbilicus.

If the perforation is not seen at once upon opening the peritoneal cavity, find the ileo-cæcal valve and examine the small intestine from the valve upwards. If no perforation is found, examine the cæcum and vermiform appendix, and then the sigmoid flexure and the rest of the large intestine. Remember, too, that the symptoms of intestinal perforation may be caused by perforation of the gall-bladder, and by the rupture of a suppurating mesenteric gland, or splenic infarct ; though these last three lesions are, fortunately, very rare. In some cases, too, where perforation has been diagnosed, peritonitis only has been found on operation, and even, in a few unusual cases, nothing abnormal within the abdomen. Having found the perforation, clear away any fæcal exudation, and invaginate the perforation with five or six Lembert's sutures of the finest silk, using an ordinary sewing-needle. The row of sutures should be placed longitudinally. Having inserted the sutures, make certain that none of the contents of the bowel can escape. It is well, before putting in the sutures, to pack round the coil of bowel concerned with sterilized gauze, so that if, during the insertion of the sutures, any fæcal matter is accidentally evacuated, it will not escape into the peritoneal cavity. An assistant must hold the portion of bowel that is being dealt with.

Unless the whole, or nearly the whole, of the peritoneum has become inflamed, and the inflammation is purulent or offensive, the writer believes that it is best not to flush out the peritoneal cavity. It should be swabbed as clean and dry as possible with pledgets of sterilized gauze. Except in cases where the peritonitis is quite localized, one or two cigarette drains should be put in the pelvis, and a small cigarette drain or a strip of gauze to the sutured ulcer.

In the few cases where the perforation is too large, or the ulcer too extensive or thickened, to permit invagination, the affected piece of bowel should be brought to the abdominal wound, and secured there in the hope of dealing with it later.

As it is necessary to get through the operation as quickly as possible, the abdominal wall should be sewn up with gut sutures passed through all the layers.

Immediately after the operation the patient should be put to bed in as upright a position as possible, the head of the bed being raised if necessary, and the after-treatment should be as in cases of 'acute abdomen'.

In cases of suspected perforation, opium or morphia should not be given until it is definitely decided whether an operation is to be performed or not. As a rule, while doubt still exists, the pain is not severe and may be relieved by hot fomentations. Opium masks the symptoms and renders diagnosis more difficult ; but when a decision is arrived at, whether for or against, a subcutaneous injection of morphia should be given.

Cystitis.—For this the best treatment is hexamine, 10 gr. three times a day. In any case of typhoid fever where the catheter has to be used, it is advisable to give hexamine to prevent cystitis. Hexamine acts best when the cystitis is due to the *Bacillus typhosus*. In the ordinary form of cystitis, with ammoniacal urine, the usual treatment should be adopted.

Thrombosis, usually of the veins of the lower extremities, especially of the left, must be treated by keeping the limb raised and bandaged (from the foot upwards). If the thrombosed vessel is painful, glycerin and belladonna, equal parts, should be smeared over the affected region. Citrate of sodium should be given in 10-gr. doses three times a day.

Serum and Vaccine Treatment.—During the last few years a few cases have been treated with the serum of horses immunized against the typhoid bacillus, apparently with some success. The amount given has been from 20 to 200 c.c., spread over several days. The vaccine used for prophylactic inoculation has also been employed therapeutically in persons suffering from typhoid fever, as have also autogenous vaccines and sensitized vaccines. The average dose is 500 million bacilli. But neither the serum nor the vaccines have in the hands of English observers led to the remarkable results claimed by Chantemesse, of Paris, for the serum prepared by himself; this, unfortunately, is not to be obtained in this country. In my own experience, both in typhoid and paratyphoid fever, the action of serum and vaccines is very uncertain. In one case they will appear to effect a most beneficial result; in another they seem to be without effect.

Every person who goes to a country where enteric fever is prevalent should be inoculated with the triple vaccine, against typhoid, paratyphoid A, and paratyphoid B.

Quarantine period: three weeks, but it is seldom necessary to enforce it.

E. W. Goodall.

ENTERITIS.—(*See* Diarrhœa.)

ENTEROPTOSIS.—(*See* Gastroptosis.)

ENTROPION.—(*See* Eyelids, Diseases of.)

ENURESIS (in Childhood.).—Enuresis as a neurosis seems to be the result of hypersensitiveness of the lumbar centres of micturition, and of deficient inhibitory control on the part of the higher cerebral cortex over the lower centres in the spinal cord. It is one of the indications of general nervous instability. It may be hereditary, congenital, or acquired. Sometimes it is a familial affection. When nocturnal only, enuresis may be due to unsuspected epilepsy.

Cases in which nervous instability is the sole cause are the most intractable; but in the great majority some exciting cause is present as well.

In a few, want of proper training may keep up the habits of infancy. Every child has to be taught to control its bladder and make known its desire to empty it. It usually learns to do so before the age of two. If incontinence is habitual after the age of three, it is a morbid manifestation. It is most serious when it is constant, day and night, and is usually then associated with some form of mental enfeeblement, or with spina bifida occulta, in which case it is incurable. Sometimes it is due to pressure on the cord by tuberculous or other lesion of the vertebræ.

The chief exciting causes of enuresis when not of purely nervous origin are: (1) *Adenoid vegetations*; (2) *Local conditions*, both within and without the bladder, which render it and the spinal centres irritable; (3) *Constitutional defects*, such as diabetes mellitus and insipidus, anæmia, and general debility; and, far more rarely, (4) *Chronic interstitial nephritis*.

Adenoid Vegetations.—These are a most potent cause of nocturnal enuresis, but probably they never give rise to diurnal incontinence. Enuresis may be part of, or the result of, night terrors, which are also common in the subjects of adenoid vegetations. But night terrors in these cases are probably set up by partial asphyxia, which stimulates the respiratory centres and perhaps also the vasomotor centres in the medulla. Thus an increased flow of urine may occur into the bladder, which empties itself because the cerebral centres of control are inhibited by fright.

Causes of Irritation within the Bladder.—Stone, cystitis from tuberculous disease, and new growth need only be mentioned here as possible causes. Vesical irritability may be caused also by hyperacidity of the urine, and by bacteriuria, and sometimes by polyuria.

Hyperacidity of Urine.—Doubts have been cast recently on the reality of this cause of enuresis, but certainly enuresis is associated at times with highly acid urine, depositing urates in large amount, uric acid, or oxalates. The enuresis in such cases is diurnal and nocturnal too. It is usually readily cured for the time being by a few doses of citrate of potash, especially if tinct. hyoscyami be added. Many believe that excessive meat diet is the cause, and certainly, in some cases, restriction in nitrogenous diet is efficacious.

Bacilluria, Coliuria, B. coli Infection.—Infection of the urinary tract by *B. coli* is not an uncommon cause of enuresis, incontinence, and frequent and precipitant micturition.

The urine is highly acid, sp. gr. 1010-20, clear at first, but on standing becomes neutral or alkaline and turbid, the turbidity being unaffected by heat or reagents. It has a characteristic offensive odour, and stains napkins or underclothing yellowish brown. A few pus cells and a trace of albumin may be found. On centrifugalizing and staining with methylene blue, *B. coli* are easily seen with an oil-immersion lens. *B. coli* flourish in an acid medium, and the treatment of coliuria consists chiefly in rendering the urine alkaline. The citrate and acetate of potash, 5 gr. of each, may be given every four hours, and the amount of alkalis increased by 20 gr. daily until 160 to 180 gr. are taken in twenty-four hours. Large doses of the citrate of potash alone sometimes set up profuse diarrhœa. The alkaline treatment should be continued for several weeks, as cessation is often followed by renewal of the symptoms. Opinions are divided as to the efficacy of hexamine. The *B. coli* is said to thrive in urotropinized urine, but the writer has frequently noticed improvement when hexamine in doses of 5 to 10 gr. has been added to the alkaline mixture. Theoretically this treatment is unsound, for hexamine is only converted into formaldehyde in an acid medium. Hence its combination with acid phosphate of sodium has been advocated. Benzoate of sodium and ammonium in doses of 5 to 10 gr. are sometimes useful. Hyoscyamus in 10- to 15-min. doses of the tincture allays vesical irritability. To prevent re-infection it is desirable to attack the *B. coli* at their source in the bowel. Constipation should be treated, and the rectum washed out with boracic or saline solution. The usefulness of salol and other so-called intestinal disinfectants is problematical.

Vaccine Therapy is unnecessary in uncomplicated coliuria, but when pyuria, with pyrexia and evidence of pyelocystitis, is present, a vaccine should be prepared from a pure culture of the organism isolated from the patient's own urine. Three million is a suitable dose for a child one year old, and 25 million for an adult. The dose should be repeated in two days' time, and the interval then gradually extended in accordance with the patient's progress. For a child of five years suffering from enuresis due to bacilluria :

℞	Tincturæ Hyoscyami	℥x	Hexaminæ	gr. v
	Potassii Citratis		Spiritus Chloroformi	℥iij
	Potassii Acetatis	āā gr. xv	Infusi Buchu	ad ℥ss

℥ij–℥iv every four hours.

Alkalinity of the Urine without cystitis is also associated with enuresis. The urine may be alkaline from triple phosphates, sometimes it is neutral. It may be of low specific gravity—1002–1005 ; it may contain a trace of albumin, and it is always marked by increase in quantity ; in fact, polyuria is the condition present. A characteristic is, that the child, on being waked at night to pass water, does so in considerable quantities, but after a short interval is found to have passed as much again in bed. In some instances the complaint may be traced to excess of farinaceous and saccharine food, for it may be cured by supplying a rigid antidiabetic diet for a few days (Percy Lewis). It must be borne in mind, however, that enuresis and polyuria, with a precisely similar condition of urine, are strongly suggestive of *chronic interstitial nephritis* in children. Polyuria in itself is sufficient to cause enuresis.

Causes of Irritation outside the Bladder.—Of these may be mentioned phimosis, balanitis, and vulvitis ; but in some cases the incontinence may be the cause, not the consequence, of the irritation. Oxyurides and constipation sometimes give rise to enuresis.

Irritability of the bladder may still produce incontinence, night and day, when the original cause of irritation has been treated or removed. The presence of very small

quantities of normal urine in the bladder is sufficient to excite it to contract. At short intervals there is a sudden call to micturate, which must be obeyed at once (pollakiuria).

Atony of the Sphincter is not a common condition, but occasionally gives rise to incontinence. The urine drips or trickles away without frequent and distressing desire to pass it. Such cases, in both sexes, may sometimes be cured by the passage of a sound.

Electricity, in the form of faradism, one pole being placed in the urethra or on the perineum, and the other to the back or suprapubic region, is sometimes of service when the sphincter is weak. Direct massage of the neck of the bladder by a finger introduced into the rectum has been recommended ; but the method is obviously objectionable, and should not be employed except as a last resource.

The treatment of an irritable bladder which will contain only small quantities of urine consists in training it to hold more. The child should be kept in bed, and instructed to micturate at gradually increased intervals. The diet should be bland, without excess of starchy, farinaceous, saccharine, or nitrogenous articles. Water or barley-water may be given freely. It is a mistake, in any case of enuresis, to restrict fluids, except shortly before bedtime. Tea and coffee should of course be prohibited.

Tincture of hyoscyamus, in doses of 1 to 30 min. or more, is a valuable vesical sedative. It may be given with citrate of potash and infusion of buchu.

In inveterate cases of irritable contracted bladder, gradual expansion of the organ by injections of weak boracic lotion, combined with local application of electricity, is said to be successful.

Treatment by Epidural Injection has been advocated in France and America. It consists in injecting normal sterilized saline solution in quantities of one and a half to five and a half or more drachms into the sacral epidural space. It is supposed to act by irritating the cauda equina, and thus conveying impulses to the lumbar centres, which are thought to be incited thereby to exert tonic or inhibitory influences over the bladder. The injections are made with an ordinary syringe, having a needle of a length of 1½ inches. The patient stands, or lies on his side with thighs flexed. The site of injection is the membrane closing the lower end of the sacral canal, which is indicated by a triangular depression situated at the posterior termination of the intragluteal fossa, and between the posterior and inferior processes of the last sacral vertebræ. The needle is inserted at this point and thrust forwards and upwards into the sacral canal. No anæsthetic is used. The operation is said to be free from danger if ordinary precautions to ensure surgical cleanliness are adopted. Success is claimed in a sufficiently large number of cases to warrant employment of the method when other means have failed. It is admitted that it is by no means uniformly curative. Its effects, if any, are probably psychical. *Hypnotic suggestion*, in a very few carefully selected cases of enuresis of purely nervous origin, may be recommended.

General Treatment.—Whatever may be the cause, the inconvenience occasioned by nocturnal enuresis may be lessened by waking the child at set intervals, to pass water. Accidents commonly happen when the child lies on his back. Therefore he should be taught to sleep on one side. A 'bobbin' or some hard object strapped to the small of the back will wake him should he turn over. Restriction in fluids just before bedtime, and in stimulant diuretics such as tea, coffee, mustard, pepper, spices, meat juices, sugar, and starch (in some cases), should be enjoined. Any of the mental and physical conditions which excite night terrors may cause enuresis, and therefore require similar treatment. Punishment of any kind is rightly condemned in any case of enuresis occurring in a child upwards of three years. But few can have escaped a slapping in infancy for this particular crime, and the nurse's palm has taught many of us to control our bladders by night. Medical men only see cases in which such primitive treatment has failed.

Constipation should be relieved. Evacuation of the bowels in the evening, before bedtime, will sometimes cure nocturnal enuresis.

Treatment by Drugs.—The utility of some has already been mentioned. It would be impossible to enumerate all the drugs which have been found invaluable by some, and useless by other, practitioners. Consideration of the various causes of the complaint will suggest appropriate remedies.

Atropine and belladonna should not be given by routine in every case. Children who wet the bed occasionally should not be poisoned indiscriminately with belladonna

for months together. The physiological action of belladonna in full doses is to cause temporary paralysis of the bladder and to lessen secretion of urine. In some cases such results are beneficial, in others not. Belladonna is useless when sphincter control is weak, also in cases in which the tendency to enuresis is kept up by local and constitutional conditions. It is seldom useful in cases of both diurnal and nocturnal enuresis.

It is most valuable in cases of habitual nocturnal enuresis. The drug should then be pushed to full doses (10 to 40 min. of the tincture for a child of 10 to 12) and be given at night only, with 10 gr. of one of the bromides. Or atropine may be given in 1-min. doses of the liquor atropinæ sulphatis, 4 gr. to 1 oz., gradually increased until the physiological effect is produced. If no good effects follow a few weeks of belladonna treatment, the utility of its continuance is doubtful. The disadvantage of keeping a child for months in a state of chronic belladonna intoxication is obvious. Few parents can be induced to persevere with the treatment after one or two experiences of children rendered half blind, staggering, delirious, and unable to swallow, in consequence. The ill effects can, however, be reduced by giving belladonna or atropine at night only. The writer has found better results from giving hyoscyamus, citrate of potash, and buchu, than from the belladonna treatment alone, but in some such cases it is probable that he was treating coliuria unawares.

Cantharides has been recommended when there is weakness of the sphincter. Lycopodium, in doses up to a drachm of the tincture, may be useful as a bladder sedative. Ergot in atony of the bladder; phenazonum as a general nerve sedative; valerianate of zinc in $\frac{1}{3}$- to $\frac{1}{2}$-gr. doses; rhus aromatica in doses of 10 to 15 min. of the fluid extract, as a stimulant, diuretic, and tonic, may all be useful when the conditions which indicate their use are present. Arsenic, strychnine, and nux vomica and iron may be required. In a few instances, where there is mental and physical evidence of thyroid insufficiency, thyroid extract may be beneficial.

Nervous Retention of Urine is not uncommon in boys. The writer has known it to occur in father and son. The father, throughout his life, could never use a public urinal, nor pass water if anyone was by. The son suffered much at school from the thoughtless teasing and practical jokes to which he was subjected by his schoolfellows on account of a similar failing. Fortunately, no further ill consequences ensued; but in such cases, as the affection cannot be overcome by drugs or strength of will, common-sense instruction should be given, in order to enable the patient to conceal it.

Hysterical retention of urine in young girls never needs active treatment by passage of a catheter. (*See also* ELECTROTHERAPEUTICS.) *Leonard G. Guthrie.*

EPIDIDYMITIS, ACUTE.—(*See* GONORRHŒA.)

EPIDIDYMITIS, TUBERCULOUS.—Tuberculous disease affects the epididymis in two forms—an acute and a chronic.

Acute tuberculous epididymitis is not infrequently a preliminary stage of the chronic form. The symptoms are slightly less severe, the pain is less intense, than in acute gonorrhœal epididymitis (*see* GONORRHŒA). A urethral discharge sometimes accompanies the epididymitis and increases the resemblance to the gonorrhœal affection. The discharge is, however, less creamy and copious, and the gonococcus is absent. The tubercle bacillus is not found in the urine or discharge unless there is urinary tuberculosis or a tuberculous cavity in the prostate opening on the urethra. There is a tendency to abscess formation in the tuberculous epididymis, and there may be tuberculous lesions in the prostate, vesicles, and second epididymis, or in the urinary organs. There is frequently a strong tuberculous inheritance, and in many cases the discharge cannot be referred to any recent or remote connection.

In acute tuberculosis the treatment should be directed to relieving the symptoms. The patient is confined to bed, and the swollen testicle supported upon a cushion. Equal parts of extract of belladonna and glycerin are smeared over the scrotum, and hot fomentations applied; or the whole scrotum is enveloped in a thick layer of antiphlogistine and covered with cotton-wool, the application being renewed daily. A brisk saline purge is administered. Urethral injections should be avoided. The acute inflammation usually subsides in a week or ten days, and gradually passes into the chronic

form of tuberculous inflammation, or an abscess may form and rupture on the surface; in the latter case the abscess is opened and the cavity lightly packed with iodoform gauze.

In the chronic form there are several types of cases: (1) A solitary tuberculous focus in one epididymis; (2) Tuberculous disease of the epididymis with foci in other parts of the genital system (seminal vesicles, prostate); (3) Disease of the epididymis with tuberculous infection of the urinary system (bladder, kidneys); (4) Disease of the epididymis with or without urinary tubercle, and with active tuberculous foci in other parts of the body (joints, spine, lungs).

The treatment of chronic tuberculous epididymitis is of two kinds: non-operative or operative.

Non-operative treatment includes climatic, general, and local treatment. A genial, sunny climate with an even temperature, nourishing food, with plenty of rich milk, should be prescribed. Cod-liver oil, creasote, iodide of iron, are useful tonics. Care should be exercised in protecting the diseased testicle from injuries, even of the most trivial kind. The scrotum is packed in a layer of cotton-wool, and slung in a well-fitting suspensory bandage. Sexual intercourse is absolutely interdicted. If the nodule softens and breaks down, the skin of the scrotum should be cleansed and the abscess opened. A sharp spoon may be used and the cavity packed with a pledget of iodoform gauze, but no attempt need be made to eradicate the whole disease by this means. The cavity heals readily, but there is a tendency to recurrence of the 'abscess', and this is treated in the same way.

The use of tuberculin (Tuberculin R.—Allen and Hanburys) is an important part of the non-operative treatment. Improvement under tuberculin may be rapid or may be delayed for some months, but unpromising cases may clear up in a remarkable manner. The treatment consists in the hypodermic injection of very small doses. Injections commence with $\frac{1}{5000}$ mgrm., and, should no reaction follow, another injection of similar strength is given at the end of a week. These are repeated each week for several weeks before increasing the dose. Should the patient complain of malaise, pain in the back, or increased local tenderness after the injection, an interval of a fortnight should be allowed to elapse before the next one. The dose is gradually raised to $\frac{1}{1500}$, $\frac{1}{1000}$, $\frac{1}{800}$, $\frac{1}{600}$, $\frac{1}{500}$ mgrm., and sometimes even higher doses may be used. Good results will, however, be obtained by keeping the patient on a dose of $\frac{1}{1000}$ mgrm., and this is the method I usually adopt. The duration of the treatment must vary with the progress of the case. The progress is usually slow, and the patient should be warned that the treatment may continue for eighteen months or two years.

The choice of radical operative measures lies between castration and epididymectomy, and the latter operation is to be preferred wherever possible. If the disease has penetrated the testicle and spread extensively in its substance, castration is indicated; but this may only become evident during the operation, and before operative measures are undertaken permission should always be obtained for removal of the testicle should this be considered necessary.

When the disease affects one epididymis, without foci elsewhere, epididymectomy should be performed, and this should be followed by a course of general and tuberculin treatment. Where foci are present in other parts of the genital system the same line of treatment should be adopted, both epididymes being removed if tuberculous. Orchidectomy should be reserved for those cases where the testicle is involved. The retention of the testicles, even when the patient is aware of the abolition of their sexual function, has an important mental effect. Operations involving removal of the seminal vesicles and prostate are sometimes performed, but are not satisfactory in the majority of cases. Where these organs are affected, removal of a tuberculous epididymis or testicle, followed by general and tuberculin treatment, gives better results.

When the urinary system is involved in the tuberculous infection, radical operation upon the genital tubercle is contra-indicated, and the same attitude must be adopted as towards a case where tuberculous disease is present in other parts of the body. While this may be taken as the rule, there are exceptional cases where a more radical method of treatment may be considered advisable. The writer has performed nephro-ureterectomy and orchidectomy upon a patient for tuberculosis confined to one kidney, ureter, and epididymis, with most fortunate results. *J. W. Thomson Walker.*

EPILEPSY.—An epileptic attack is a *symptom*, which may depend on a variety of different causes, the detection of which affords the necessary indications for the treatment of the case.

Epilepsy proper is a *disease* characterized by a tendency to the recurrence of epileptic attacks. The fits may be severe (*grand mal*) or slight (*petit mal*). Most epileptics have both major and minor attacks; when the former are met with alone, the outlook is distinctly more favourable than when both forms occur; cases in which there are only minor attacks are usually the most intractable.

It is customary to subdivide cases of epilepsy into two groups—*idiopathic* and *organic*. The first includes those cases in which no obvious cerebral lesion exists, while to the second belong those in which gross intracranial disease is present.

Epileptiform or Jacksonian attacks are synonymous terms applied to localized convulsive fits, which begin in a certain muscular group, have a deliberate spread, are usually unattended with impairment of consciousness, and are followed by a degree of temporary paralysis in the parts convulsed. It is important to remember that the occurrence of Jacksonian fits does not necessarily imply the existence of gross cerebral disease.

Reflex epilepsy is a term sometimes used to denote those uncommon cases in which the disease is apparently dependent on an extracerebral cause.

Treatment may be considered under the following headings: (1) The means by which it is possible, in some cases, to arrest an attack; (2) The treatment of an epileptic attack; (3) Status epilepticus; (4) General measures and method in the treatment of the disease; (5) Drug treatment; (6) Surgical treatment, with special reference to organic epilepsy; (7) The colony system.

1. **Arrest of an Attack.**—When there is a distinct aura, it is, in very exceptional cases, possible to avert an impending attack. Thus, a powerful mental or muscular effort is, in rare instances, effective. The inhalation of amyl nitrite, immediately the warning is felt, is sometimes successful; and where this is found to be so, the patient should carry with him a box of capsules. Strong smelling-salts occasionally act in a similar way.

When the aura is localized to one hand, the fit may sometimes be arrested by firmly grasping the wrist of the affected side. If it is found that a fit can be thus averted, the patient may wear a strap or tape fastened conveniently round the wrist, which he can immediately tighten on the first sensation of the aura. This procedure may result only in a postponement of the attack, which, when it does occur, may be of unusual severity.

2. **Treatment of an Attack.**—The physician, if present at the onset, should, firstly, place the patient in the recumbent posture; secondly, loosen the clothes about the neck and chest; and, thirdly, insert between the teeth a tongue depressor, cork, or some such object, in order to prevent tongue-biting. Little advantage is to be gained by attempting to cut short the attack; but should the tonic phase be unduly prolonged, or should a second attack follow immediately upon the first, a few whiffs of chloroform, or an inhalation of nitrite of amyl, may be administered.

The patient's friends may be told that there is practically no danger, for an epileptic fit is in itself an extremely uncommon cause of death.

Vomiting occasionally occurs towards the end of a fit. If any tendency to this is observed, the patient should be turned on his side, in order that the risk of regurgitation of the vomited matter into the respiratory passages may be avoided, an accident which has been known to be attended with fatal results.

Post-epileptic Phenomena.—After the termination of the fit, the patient often falls into a deep sleep, in which it is well to leave him undisturbed. Severe headache, often frontal, is an almost constant sequel, and is usually relieved by a 10-gr. dose of phenacetin. Hysterical seizures sometimes follow. Since it is especially in association with *petit mal* that these phenomena are prone to occur, their true nature is apt to escape recognition. The immediate treatment is that of a true hysterical fit, while a therapeutic course, appropriate to the epileptic condition, must be instituted. Among other post-epileptic states to which reference may be made are the outbursts of maniacal excitement which sometimes follow a fit, which may constitute a source of danger to the community. For such a case, if it is beyond the control of a responsible attendant, an asylum is the proper place.

When post-epileptic automatism is a feature of the case, it is hardly necessary to say

that the patient's relatives and fellow-workmen should be instructed to keep a close watch upon his movements.

3. **Status Epilepticus.**—This grave and often fatal condition is fortunately rare. Inhalations of chloroform, or nitrite of amyl, may check the attacks, but their effect is often only temporary. Bromides are usually ineffectual. Chloral hydrate is generally the most effective drug in these cases. It should be given in a dose of 30 to 60 gr. by the rectum, the dose being repeated, if necessary, in the course of an hour. Hypodermic injections of hydrobromate of hyoscine, in doses of from $\frac{1}{150}$ to $\frac{1}{50}$ gr., may be given should the last-named drug prove ineffective. Morphia, administered hypodermically, in doses of $\frac{1}{4}$ to $\frac{1}{2}$ gr., has met with the approval of some authorities. Strychnine is undoubtedly valuable when the attacks have continued for some time, and when there are signs of increasing general and cardiac weakness. If the drugs already mentioned have proved unsuccessful, $\frac{1}{50}$ gr. may be given hypodermically, and repeated, if necessary, according to the effect produced.

Respiratory embarrassment, due to falling back of the tongue, may prove fatal during the status epilepticus. If there is reason to suspect this accident, the patient should be turned on his side, and the tongue drawn forward with forceps.

4. **General Measures and Method in the Treatment of the Disease.** — The first necessity is a correct diagnosis, a matter by no means always easy, since the account given by the patient, or his friends, often constitutes the only positive evidence bearing upon the diagnostic problem.

Having made his diagnosis, the physician's next duty is to conduct an *exhaustive inquiry into the patient's habits and general health* in relation to the occurrence of fits, hoping thereby to detect evidence as to possible immediate exciting causes. Thus dietetic irregularities, constipation, unnecessary excitement, may in different cases appear to be of causal import, requiring special attention when regulations as to treatment are laid down.

Anæmia, if present, calls for correction, as does any other intercurrent departure from the normal state of health. A careful examination as to the existence of any *peripheral source of irritation* is necessary. Thus, intestinal worms, adenoids, an adherent prepuce, an aural or nasal polypus, bad teeth, or an error of refraction, may play a part in determining the occurrence of convulsions ; but the tendency to regard them as of causal import is commonly exaggerated. The indiscriminate operative treatment of local conditions, such as the practice of tenotomy in cases of so-called eye-strain, is, in the light of our present knowledge, to be condemned. Unless the local abnormality is so pronounced as of itself to demand local treatment, or unless there appears to be very strong reason for relating it directly with the incidence of the attacks, there is no call for operative interference.

The general treatment of epilepsy is as important as the drug treatment. Precise instructions should be laid down, adapted to meet the requirements of each case. Regularity and moderation are to be the guiding principles. The benefit which ensues from these general measures has been amply demonstrated by the colony system, to which special reference will be made later.

The *diet* best suited to epileptics has been the subject of considerable discussion ; but beyond the advisability of limiting the quantity of red meat, which should be taken not more than once a day, of abstaining from articles known to be indigestible, with special reference to the individual case, and above all of avoiding over-eating, it is unnecessary to lay down further directions.

A chlorine-free diet has been lately recommended, and its efficacy confirmed by a number of observers. The principle involved is the substitution of the bromides for the common salt of everyday use. There is, as yet, however, no conclusive evidence to show that the results so obtained are superior to those seen when the bromide salts are administered in the usual way, and any little advantage so derived is counterbalanced by the inconvenience involved in the preparation of a special diet, since this practically places the method within the reach of the wealthier classes only, or of special institutions.

The patient must take his food leisurely. The time of meals should be adhered to with strict punctuality, and the last meal of the day should be so arranged as to allow of completion of digestion before the patient goes to bed.

Alcohol should be forbidden. Tobacco may be allowed in moderation. Sexual excess is to be avoided.

Attention to the bowels cannot be too strongly insisted upon, for constipation is a common exciting cause of the attacks. Where there is this tendency, a small dose of cascara may be given in combination with the bromides or other drugs which the patient is taking, the dose being altered as occasion demands.

Outdoor exercise is to be encouraged, although any form of exercise necessitating strenuous physical effort, or in which the occurrence of an attack might be attended with special danger, e.g., swimming, boating, etc., must be vetoed, unless the patient has with him companions who clearly understand the responsibilities which devolve upon them.

The *education* of epileptic children is a question regarding which the physician's advice is often sought. No doubt it is better, when the attacks occur frequently and are severe, to keep the child away from school; indeed, it often happens that the teacher's attitude permits of no option in the matter. It is, however, highly desirable that the epileptic's time should be fully occupied, although all work involving mental strain, such as that required in preparation for an examination, is to be deprecated. Among the lower middle classes the defective education which absence from school implies constitutes a serious handicap in after life. Irregular attendance at school, in association it may be with a degree of mental deficiency dependent on the disease from which he suffers, often brings the epileptic child into competition with his juniors, and this cannot but have a depressing effect upon a sensitive nature. In addition, the undue irritability and passionate tempers often exhibited by these children may prove incompatible with the requisite discipline of a mixed class. It is to be hoped that the time is not far distant when, in all the larger towns, special schools or classes will be set apart for sufferers from this malady.

The *selection of a profession or trade* requires careful consideration, and must be decided on general principles. An outdoor occupation is advisable in confirmed cases. Employments which are fraught with danger must be avoided. The admission of epilepsy is, in itself, often sufficient to debar selection, altogether apart from the individual's capabilities for the post he seeks.

Regarding the *question of marriage*, it may be said that matrimony will probably produce little alteration in the frequency or severity of the attacks. In cases of the *idiopathic* variety, particularly when there is a history of hereditary transmission, the physician's duty is to urge his patient not to marry, by emphasizing the probable consequences of procreation. In cases of idiopathic epilepsy, with evidence of inheritance, Gowers remarks that "consideration of the facts suggests that, if there are six children, the chances are against the escape of all from epilepsy, insanity, or imbecility".

5. **Drug Treatment.**—In order to obtain the best result, it is essential that the physician should have a definite plan on which his line of action is to be conducted. In every case the question arises, what drug, or combination of drugs, will give the best results without, at the same time, affecting the patient's mental or general health. A solution of the problem can be arrived at only by experiment, while it must at the same time be remembered that frequent haphazard alterations in treatment cannot be too strongly condemned. When it has been determined from, it may be, special features of the case, to commence by giving a particular drug or combination of drugs, this should be given a thorough trial before any change is made.

In every case a record of the fits should be registered. A book should be kept by the patient for this purpose, in which are noted the day and hour at which each fit occurs, and any special exciting cause which may be thought to have produced it. In this book, all changes in treatment are to be entered by the physician. Epileptic patients are often taken from one physician to another—it would be much to the advantage of both if the patient could produce a record of his previous treatment and its effects.

The efficacy of the *salts of bromine* has long been recognized in the treatment of this disease. True, in some cases the bromides are of no benefit, and, in a minority of these, other drugs are occasionally of value. These instances are, however, exceptional. In most cases the bromides, either alone or in combination with other remedies, produce a beneficial effect on both the severity and the frequency of the fits.

The bromides of potassium, sodium, and ammonium are the salts upon which most reliance is placed, authorities differing as to the most effective form; a combination of all three is regarded by some as the most potent method of administration. The bromides of strontium and of camphor are also used to a limited extent, but appear to have no special

advantage. Bromide of lithium has been commended where gout is a prominent feature of the case. So far as we are aware, no general superiority of one form over another has been demonstrated, but individual cases are undoubtedly met with in which the exhibition of one or other combination appears to be associated with special benefit. Perhaps the bromide of potassium is that most generally used, and it is this form we usually prescribe, in the first instance at least.

Dosage.—The amount of bromide and time of day when it should be given must vary in different cases. The treatment may be commenced by giving 10 to 15 gr. twice a day twenty minutes after food, with a double dose at bedtime. It is not advisable to begin at once with a larger dose than this, unless the patient has previously taken the drug, or is under close observation ; for occasionally individuals are met with who are peculiarly susceptible to the action of these salts. When nocturnal attacks alone occur, 25 gr., shortly before bedtime, is sometimes sufficient to produce arrest. A very common time for the occurrence of fits is in the morning, immediately after the patient rises. When this peculiarity is pronounced, a dose of bromide may be given with advantage following a morning cup of tea soon after the patient wakens. The quantity of the drug should be gradually increased until the maximum dose is attained which the patient can take without deteriorating his general or mental health. Most authorities are agreed, however, that there is little advantage in increasing the dose to more than 90 gr. in the twenty-four hours.

There are two *disadvantages associated with the bromide salts.* An acne rash is apt to be produced. It has been claimed that bromide of strontium possesses special virtues in avoiding this complication, but the evidence adduced does not appear to be convincing. Experience has shown that the addition of 2 min. of liquor arsenicalis to a 20-gr. dose of bromide is usually effective in preventing the development of acne. Arsenic taken over a long period of time, even in very small doses, unfortunately tends to cause pigmentation of the skin. A 10-gr. dose of salol at bedtime is also said to lessen the tendency to bromide acne. Another disadvantage of the bromides is their blunting effect on the mental faculties. This, however, is seldom seen unless very large doses are given, and the dulling of the intellect so common in epilepsy is more often a direct consequence of the disease than of the remedy.

If complete cessation of the fits follows the exhibition of the bromides, the treatment should be on no account altered ; on the other hand, where no improvement follows, other remedies must be tried. When there is distinct improvement up to a certain point, as shown by diminution in the frequency and severity of the attacks, a corresponding dose of sodium, ammonium, or strontium bromide may be substituted, in the hope of producing still further benefit.

Having obtained the maximum effect of the bromides, if the fits still continue it may be found that the addition of some of the remedies referred to later will be beneficial. The dose of the new remedy may be increased, or, if there is no noticeable improvement, another drug may be substituted, the quantity of bromide remaining unchanged. In this way it is often possible to arrive at some opinion as to the drug or combination of drugs, and their dosage, most suitable in any given case, although it must be admitted that relapses due to undetected causes are frequent sources of difficulty in arriving at definite conclusions.

Amongst the numerous *drugs other than the bromides* which have been recommended, the writer agrees with those who attribute a high place to borax. Biborate of soda was first introduced by Sir William Gowers in the treatment of this disease. Occasionally, when the bromides fail, borax is of the greatest value, particularly perhaps where *petit mal* occupies a prominent place in the clinical picture. Borax may be given alone or in combination with the bromides, beginning with doses of 5 gr., three times a day, and gradually increased. Gastro-intestinal symptoms are occasionally set up by borax, and its prolonged administration may be followed by psoriasis.

The value of luminal, a coal-tar product, has recently been lauded by Dercum, and the writer has already observed several cases in which the exhibition of this remedy has produced striking effects. One or two grains may be prescribed in a cachet at bedtime, or three times a day. The action of the drug would appear to be of value only in the sense that it keeps the attacks in abeyance or diminishes their frequency during the period of

administration. If further experience corroborates present impressions, luminal will undoubtedly prove to be of value in the treatment of epilepsy.

Digitalis, when given with the bromides, is sometimes attended by benefit distinctly in excess of that obtained from the latter salts alone, especially, it is affirmed, when there is any cardiac complication.

Zinc oxide is of undoubted value in certain cases, more especially in the treatment of *petit mal*. The drug is best administered in pill form in doses of 2½ gr. two or three times a day. The dose may be increased to 5 gr. or even more, but is to be reduced if it produces sickness.

Atropine ($\frac{1}{200}$ to $\frac{1}{125}$ gr.) is recommended by Oppenheim.

Belladonna (5 to 10 min. of the tincture) and the nitrites, given in the form of liquor trinitrini (1 to 2 min.), appear occasionally to be of some use when added to the bromides.

Potassium iodide may be of the greatest service where the disease is dependent on syphilis, and is of occasional use in the epilepsies of later life associated with cerebral arteriosclerosis, which so rarely yield to bromide treatment.

A host of other remedies, to which it is unnecessary to refer, have been from time to time recommended. A serum treatment has been introduced by Ceni, but its value has not been established.

Finally, if treatment is to be attended with success, the *remedies prescribed must be administered with punctilious regularity and over an extended period.* Failure to carry out these essentials is one of the chief reasons why disappointing results are so common. The patient should be most emphatically given to understand that unless he adheres rigorously to these particulars, the prospect of cure is minimized. Indeed, it is advisable in the majority of cases to throw this responsibility upon his relatives. The treatment must be continued until at least two and preferably three years have elapsed during which time no fit has occurred, although during the second twelve months the dose may be reduced. Any intercurrent illness must interfere with the administration of the remedies only in most exceptional circumstances.

There can be no doubt as to the importance of early treatment in cases of epilepsy. Relatives, however, are often loth to carry out the physician's instructions, particularly when only two or three attacks have occurred and at long intervals, for by so doing the patient is apt to be stigmatized as an epileptic, an unpleasant fact which they are only too anxious to forget. In cases of the kind, the writer adopts the attitude that the occurrence of one or two fits for which no obvious cause can be found does not necessarily indicate that the patient is an epileptic, but that a prolonged preventive course of treatment is essential, and the relatives are responsible if this is not carried out.

Whenever there is an increase in the number or severity of the attacks, a most careful examination should be undertaken with the object of ascertaining, if possible, the cause of the relapse. Indeed, it is advisable in every case to make a very thorough study of the case at definite intervals, in order to make sure that no therapeutic indications have escaped detection.

With regard to the '*cure*' *of idiopathic epilepsy*, it is interesting to note that Dr. Aldren Turner found, among 147 cases which had been under observation for at least nine years after the disease had become definitely established, 15 (10·2 per cent) in which the fits had been arrested for nine years or more. He found that in 50 per cent of the cases in which the disease was arrested, the arrest had taken place within one year of the commencement of systematic treatment.

6. **Surgical Treatment.**—The surgeon's aid is seldom required in the treatment of idiopathic epilepsy. In rare cases, it is true, his help may be solicited to perform a circumcision, or to remove a polypus or foreign body from the aural or nasal cavities. Very exceptionally, in cases in which the involvement of a nerve in the scar of an old wound has been shown to be directly related to the epileptic state, excision of the scar or stretching of the nerve has resulted in cure. To such operations as ocular tenotomies, castration, and ligature of the vertebral arteries, it is unnecessary to refer. Excision of the sympathetic trunks in the neck is unjustifiable. Opening the skull with the hypothetical object of relieving intracranial pressure, in cases of idiopathic epilepsy, is an operative procedure which now has few, if any, adherents. The removal of a small area of cortex, in cases in which the fits commence with a localized motor aura, has not been followed by permanent

results. It is particularly to be remembered, in this connection, that any operation may be temporarily followed by cessation of the fits, just as after an acute illness, after an injury, or during pregnancy the attacks sometimes remain in abeyance for many months. This must always be borne in mind in judging of the effects of surgical intervention.

The above remarks do not apply with equal force to those cases in which the *epilepsy is of traumatic origin*. For instance, when there is a scar over the motor cortex corresponding in situation to the area from which a localized spasm initiating the fit proceeds, and particularly when there is a depression in the bone, operation and excision of the scar is indicated. But it must be remembered that the removal of the local source of irritation is not always synonymous with cure ; for in cases of long standing the cerebral cortex may acquire the epileptic habit of spontaneous discharge.

In a case in which there has been a definite injury to the head, and in which the initial discharge does not correspond to the site of the wound, the prospect of cure by operation is much more gloomy. If the local discharge remains constant, the fits obstinately resist medicinal treatment, and the patient's mental condition is deteriorating, excision of the discharging area may be undertaken. When the fits do not commence with a constant local spasm, even if there is definite evidence of cranial injury, the outlook is still worse. Worst of all are those cases in which the attacks are general and have persisted over a long period ; in these cases the hope of permanent benefit by local operation is almost nil.

The operative treatment of Jacksonian attacks associated with intracranial new growths and meningeal hæmorrhage is referred to in the articles dealing with these subjects.

7. **The Colony System.**—The purpose of the epileptic colony or township is to provide education and employment for the sane epileptic. The child receives an education according to his mental capacity. Later, he learns some trade or occupation which may prove of use in after life if his condition improves, and which serves at least to keep him employed and interested. His self-respect is raised and his interest in life aroused when he sees that he is capable of leading a useful existence and is no longer a burden on his relatives ; and, lastly, he is living a regular life in the open air, free from excitement and worry, a life which is specially adapted to the treatment of his affection.

A study of the results of treatment shows the advantage of this method. In the majority of cases the fits are reduced in number and severity, and the mental state is improved, while a small percentage of cases is discharged cured.

The following is a list of epileptic colonies and homes in this country, with some details as to rates, application for admission, etc. :—

The Chalfont Colony, St. Peter's, Bucks, the property of the National Society for Epileptics. Secretary, G. Penn Gaskell, Esq., Denison House, Vauxhall Bridge Road, Westminster, S.W.1. Approved male or female patients are admitted at a charge of 21s. per week (subject in special circumstances to reduction at the discretion of the Committee). The Society also has a Convalescent Home for male epileptics convalescing after illness or accident, or for other reasons requiring temporary admission ; charge, 24s. per week.

David Lewis Manchester Epileptic Colony, Warford, Alderley Edge, Cheshire. Secretary, Charles Edwin Marshall, 38, Barton Arcade, Manchester. Men, women, and children (300 beds). First, second, and third class colonists. Charges 21s. to 66s. per week.

County of London Colony for Epileptics, Ewell, Surrey. Medical Superintendent (vacant). Part of Colony set aside for male private colonists above the age of 16. Charges vary according as colonist claims settlement in County of London or lives outside County. (This institution is at present in the occupation of the War Office as a hospital for neurasthenics. It is not likely to revert to its proper function for at least two years.)

Home for Epileptics, Maghull, near Liverpool. Hon. Sec., W. Harold Grisewood, Esq., 2, Exchange Street East, Liverpool, 350 beds. First, second, and third class according to accommodation. Charges, 17s. 6d. to £3 per week.

Meath Home of Comfort for Epileptics, Westbrook, Godalming. Applications to Lady Superintendent. 85 beds. For epileptic women and girls between the ages of 15 and 35. Charge, 13s. 6d. per week.

St. Luke's Home, Park Road, Parkstone, Dorset. Applications to Lady Superintendent. For women and girls over 16. Charges now from 25/- per week.

Lingfield Epileptic School and Homes, Lingfield, Surrey. Superintendent, J. Tylor Fox, M.A., M.D. Epileptic children of both sexes. Charges from 21s. per week. Also a few vacancies for epileptics over 16. Charges from 24s. a week.

Stainsthwaite Epileptic School. Secretary, T. Gordon-Thompson, Esq., Highgate, Kendal. For boys under 12. Charge 26s. per week.

Colthurst House School for Boys, Warford, Alderley Edge, Cheshire. Secretary, Charles Edwin Marshall, 38, Barton Arcade, Manchester. 18 beds. Charge, 42s. per week.

Edwin Bramwell.

EPIPHORA.—(*See* LACHRYMAL APPARATUS, DISEASES OF.)

EPISCLERITIS.—This disease is peculiarly prone to recur, and is met with most frequently in patients with a rheumatic or gouty diathesis, and with syphilis ; also in subjects of oral sepsis and other conditions which may give rise to a general toxæmia.

TREATMENT must be both local and general.

Local Treatment.—Protection of the eye, hot boracic bathing, and atropine, 2 gr. to the ounce, are especially indicated. Pain is often extremely severe, and is best relieved by two or three leeches to the temple and heat constantly applied to the eye, with hot bathing, repeated fomentations, or the muff-warmer (*see* IRITIS). In the more chronic cases with little pain, ung. hydrargyri oxidi flavi, 1 per cent, may be useful, combined with gentle massage over the lid. Application of the constant current and scarification of the nodule have been advocated.

General Treatment.—A brisk purge should be given at the commencement of the attack, and care taken to procure a free daily action of the bowels. The diet must be carefully regulated and stimulants avoided. Diaphoresis induced by the hot pack, fortified by a hot drink or, if necessary, by an injection of pilocarpine nitrate $\frac{1}{15}$ to $\frac{1}{3}$ gr., will be found invaluable, cutting short the attack and relieving pain. Internally acetylsalicylic acid, salicylate of soda, and iodides often prove beneficial. Occasionally the pain is so intense that it may be necessary to give subcutaneous injections of morphia. If syphilis is the cause, it must be treated energetically. When oral sepsis exists, it should meet with scrupulous attention at the hands of a dentist who realizes its importance. *Albert Hancock.*
[(*Revised by W. Tindall Lister.*)

EPISTAXIS.—Bleeding at the nose may be due to general or local causes, and before attempting to arrest it, it is necessary to determine the cause of the trouble and its point of origin.

When due to some *constitutional disturbance* or severe organic disease, epistaxis is frequently beneficial, and unless the loss of blood threatens to become excessive no attempt should be made to stop it. Thus bleeding may be beneficial in some chronic diseases of the heart and lungs, and in certain acute diseases, such as acute bronchitis. It may relieve the strain of excessively high blood-pressure resulting from over-exertion, excitement, anger, or other emotional causes, and thus may possibly ward off an attack of apoplexy or prevent heart-strain. If, however, the bleeding is excessive, measures must be adopted to stop it. The patient should lie down quietly with the head raised, the face should be sponged with cold water, or a handkerchief dipped in cold water should be laid across the nose. The water should be iced if possible, and the patient may be encouraged to suck ice. If the bleeding is arrested, the patient should remain quiet for a few hours, avoid exertion, and take all food cold, with no stimulants. If the bleeding continues and is not checked by the application of cold, it will generally be necessary to pack the nose. When the bleeding comes from the anterior part of the nasal septum, it is sufficient to pack the anterior part of the nose with a plug of wool or gauze, and thus to bring direct pressure to bear upon the part. If thus the bleeding is temporarily arrested so that its exact source can be determined, cocaine and adrenalin should be applied, and the bleeding spots sealed by the application of the electric cautery at a dull red heat. The application of nitrate of silver—a small bead fused on the end of a probe—is equally efficacious when the cautery is not at hand. If there is no indication of the source of the bleeding, the entire nasal cavity should be packed. The better and more comfortable method is to introduce into the nose a thin rubber bag, such as a Howard's nasal bag, and to inflate it when in position. If this is not available, the nose must be packed with strips of lint or gauze. The left forefinger is passed through the mouth into the posterior nares, a strip of gauze is passed through the anterior nares until it impinges on the finger, and successive strips are introduced until the whole nose is packed tightly from behind forward, the finger in the post-nasal space preventing the gauze escaping from the posterior nares. The packing, or rubber bag, should be removed within twenty-four hours, and the nose gently irrigated with a weak antiseptic lotion to avoid sepsis. Removal of the gauze may set up fresh bleeding ; this is not so likely to happen with the rubber bag, which is deflated before it is removed, and does not adhere to the tissues. For

the next day or two the patient must remain quiet, avoid blowing the nose, take all food cold, and avoid stimulants.

When hæmorrhage from the nose is the result of a *gross lesion*, such as ulceration or malignant or other tumour, and the bleeding is serious and not arrested by the local application of cold, it will generally be necessary to pack the nose as above described. Subsequently the cause can be dealt with.

In the commonest form of epistaxis the bleeding takes place from small dilated venules on the anterior part of the septum, and is due entirely to local causes. There is generally a small dry area or ulcerated patch on the extreme anterior part of the septal mucous membrane, the so-called *anterior rhinitis sicca* or atrophic ulcer of the septum; and the bleeding is the result of forcibly detaching the small adherent crusts by picking or violently blowing the nose. The septal condition should be treated by the frequent application of a mild ointment, such as weak boracic ointment or plain lanolin, and the patient warned against picking the nose. These measures alone frequently effect a cure. If they fail, a solution of cocaine and suprarenal extract should be applied, the bleeding spots should be sealed, and all the small varicose vessels obliterated by a few touches with the red-hot cautery. The affected part of the septum should be frequently smeared with ointment to prevent crusts forming until healing is complete. If at any time severe hæmorrhage occur, the patient may be taught to arrest it immediately by passing a strip of gauze or wool into the affected nostril, and bringing direct pressure to bear upon the part by compressing the nostrils with the fingers.

In those rare cases of persistent epistaxis due to *multiple inherited telangiectases*, where the mucous membrane of the nose is covered with tiny nævoid spots which bleed at the least touch, the most extensively affected areas of the mucous membrane should be excised or destroyed with diathermy. Individual spots may subsequently be destroyed with the cautery or with nitrate of silver, and repeated applications are required, as the nævoid spots constantly re-form. Drugs so far have seemed useless. *H. Lambert Lack.*

EPULIS.—(*See* JAWS, TUMOURS OF.)

ERUCTATION, NERVOUS.—(*See* FLATULENCE.)

ERYSIPELAS is an infective condition of the skin or subcutaneous tissues, due to a peculiar variety of streptococcus. It is customary to consider certain special varieties.

1. **Erysipelas Proper,** the infection being confined to the lymphatic spaces immediately beneath the epidermis, a form usually unaccompanied by swelling of the tissues except in such situations as the scrotum and the eyelids.

2. **A Superficial Form of Cellulitis,** indicated by swelling and redness of the part.

3. **Deep Cellulitis,** which is an infection of the subfascial layers. Only as the process tracks towards the surface does the skin become red. There are, however, considerable pain and swelling, and the whole part has a brawny, indurated feeling.

The last two varieties may be associated with a large amount of tissue destruction, owing to the sloughing of the skin stretched over the inflammatory exudate.

TREATMENT.—As these infections are more liable to occur in patients whose constitution is unsound, either from glycosuria or albuminuria, a careful examination of the urine must be made. As a routine the bowels should be opened by a brisk purge; subsequently, stimulants and tonics may be administered, quinine and iron being most useful. A rigor is often the first symptom of the superficial variety, and in many cases—especially in children—the constitutional symptoms are most severe. The temperature may rise to 104° or 105°.

Local treatment consists in applying lotions or protective dressings, leaving the disease to run its course, a form of treatment suited to mild cases; but any unhealthy focus from which the infection has arisen should be actively treated with pure carbolic acid. One of the best applications in mild forms of the disease is a lead and opium lotion, or, if preferred, gauze wrung out of 1–60 carbolic may be substituted. Ichthyol has been used in the form of a paint with much success.

If the attack is a severe one, and if the part affected is suitable for more active treatment, the weak tincture of iodine or a strong solution of silver nitrate may be painted

½ to 1 inch away from the red, sharply-defined edge. The object of this treatment is to excite a protective leucocytosis which will be able to destroy the infection or the organisms as they reach this protected zone. Kraske scarifies the area round the erysipelatous rash with a fine knife in order to produce the same effect, and it is said that a more energetic and satisfactory reaction is produced by this method.

Incisions are not as a rule required in this variety; but when the scrotum or the eyelids are attacked, the loose cellular tissues become swollen and œdematous, and the knife may be used with advantage. Minute punctures only should be made. In alcoholics, erysipelas may attack the mouth and pharynx, an exceedingly dangerous situation, since there is considerable risk of œdema of the glottis supervening. Erysipelas of the face and scalp may give rise to serious intracranial complications, since the infective process may spread along the numerous channels of communication into the cranial cavity.

Treatment of the other cellulitic varieties must be conducted along more rigorous lines. In a few cases it may be advisable to try the effects of rest and moist antiseptic dressings for twenty-four hours, but, with this exception, the sooner incisions are made into the inflamed area the better. When active treatment is delayed, the inflammatory process tends to burrow along the fascial planes, and deep-seated abscesses will form. The incisions should be free and numerous, with a due regard to the position of important structures, and they should extend, in the case of the deep cellulitis, right through the deep fascia. Drainage tubes must be employed in those cases where there is a localization of the pus.

After-treatment will consist in supporting the patient's strength, so that he may be able to neutralize the toxins elaborated in the affected region. Alcohol may be required, and iron, quinine, nux vomica, and arsenic will be of service. The part should be dressed with moist antiseptic dressing. In many cases constant irrigation with weak carbolic (1–200) or boracic acid is indicated, or as an alternative, if a limb is affected, it may be immersed in a bath of the same antiseptic. It is essential to see that only a very weak solution is used, as the continued application of strong antiseptics is very injurious to the tissues, and may lead to poisoning. As soon as the acute inflammatory phenomena have subsided, massage and passive movements should be cautiously undertaken, so as to prevent undue fixation.

The greatest care must be taken that the infection from these cases is not conveyed to others, especially to surgical or midwifery patients. Cases of erysipelas and cellulitis should be isolated. *W. H. Clayton-Greene.*

ERYSIPELAS (other than Surgical).— In slight and limited cutaneous erysipelas it will be sufficient to dust the affected skin with a powder of starch and oxide of zinc. But when the affection is extensive and painful, lotions or ointments should be employed: of the former, lead, or lead and opium lotion, or a 10 per cent solution of ichthyol in water; of the latter, vaseline, to which 10 per cent of ichthyol has been added. When there is sloughing or abscess formation, incisions should be made and frequently-renewed hot boracic fomentations applied.

In erysipelas of the fauces, hot fomentations should be applied to the neck to relieve the pain, and the patient should inhale air charged with steam. If the latter treatment fails to afford relief, ice may be given him to suck. As the erysipelatous inflammation may spread to the larynx, the medical attendant must be prepared to perform tracheotomy.

In all except the very slightest cases it is well worth while to try the subcutaneous injection of a polyvalent antistreptococcic serum in doses of 20 to 25 c.c. daily. Though its action is uncertain, I have met with cases in which undoubted benefit has resulted from the use of this remedy.

For general treatment *see* FEVERS. *E. W. Goodall.*

ERYTHEMA.

Erythema Induratum Scrofulosorum. — The characteristic lesions of this disease on the lower part of the leg posteriorly have, in the past, generally been treated by rest and strapping, along with general tonics. These latter will probably maintain their place. But since the time the writer first used *x* rays in this disease, he has not found it necessary to insist upon the lying-up previously required. Under repeated exposures to the rays,

the ulcers heal up and the induration disappears, even although the patient continues at work so obviously unsuited to rest as that of a message girl. In some cases nodules break down under the treatment, but this should not be taken as a contra-indication, for the healing process soon sets in, and goes on satisfactorily. We have recently used powdered uranium nitrate with such excellent results, in a case which had proved obstinate to *x*-ray treatment, as to encourage further experiment.

Erythema Iris.—There is no satisfactory routine treatment for this disease. Indeed its invariable tendency to recurrence shows as much. The lesions should be protected from further injury by some harmless application such as zinc ointment. The favourite boric ointment should be avoided, as it often causes great pain. The salicyl compounds are occasionally useful, but not often, and general tonics, such as quinine and the like, may be tried. Most, however, can be done by keeping the patient in the best of health, and encouraging him by telling him that the attacks will eventually cease.

Erythema Multiforme.—It is quite impossible to indicate with any definiteness how this protean condition can be successfully treated. The manifestations in the skin may be produced by a whole series of different causes, which must be sought for and eradicated. It may, however, be said generally that erythema multiforme is the expression of some form of intoxication, and that the search for some toxin should be thorough. In many cases it is obvious some dietetic poison can be held directly answerable for the eruption, in others it is probable that putrefactive changes in the intestines are the source of the poison ; and very strict attention to diet, and the administration of intestinal antiseptics, will often result in the disappearance of the eruption.

Empirically, certain drugs are given. Ichthyol, quinine, sulphur, iodide of potassium, and ergot have been recommended. Patients who suffer from these last two forms of erythema, both almost certainly toxic in origin, derive as a rule great benefit from the drinking of large quantities of water. Ordinary water does quite well, but many patients can be persuaded to drink larger quantities if the water has a name attached to it.

Erythema Nodosum.—(*See* Rheumatism.) *Norman Walker.*

ETHMOIDITIS.—(*See* Nose, Accessory Sinuses of.)

ERYTHROMELALGIA.—The treatment of this rare condition is very unsatisfactory. Rest in the recumbent position, with the limb raised, is the first essential. It should be carried out for some weeks, or even months. It may be combined with gentle massage and cold applications locally. As excessive smoking is believed to aggravate the condition, the use of tobacco should be stopped. Electrical treatment is sometimes useful, and in one case recovery is said to have taken place after twenty applications of faradism. Drugs are of little help. It is sometimes necessary to use morphia in order to afford relief ; but there is a great danger of establishing a habit, although a cure is reported in one instance after the hypodermic injection of morphia and atropine into the side of the foot night and morning for three weeks. Iodides should be given in all cases with a syphilitic history.

Search should be made for any possible causes of pressure on vessels or nerves (e.g., aneurysm, tumour, inflammatory thickening, cervical rib, etc.). Stretching of the posterior tibial nerve has sometimes been carried out with advantage ; and in intractable cases amputation may have to be considered. *Robert Hutchison.*

EYE, INJURIES OF.—We shall consider the treatment of ocular injuries under two main headings : (I) *Injuries without perforation of the globe ;* (II) *Injuries with perforation.*

I.—INJURIES WITHOUT PERFORATION.

In this group will be included : (1) Contusions, with consequent internal injuries : (*a*) Iridodialysis, and paralysis or rupture of the sphincter of the iris ; (*b*) Paralysis of the ciliary muscle ; (*c*) Iritis and cyclitis (*see* Iritis) ; (*d*) Dislocation of the lens, and cataract ; (*e*) Hæmorrhage into the anterior chamber or vitreous ; (*f*) Rupture of the sclerotic ; (*g*) Detachment of the retina and retinitis (*see* ophthalmic text-books). (2) Abrasions of the cornea. (3) Foreign bodies in cornea or sclerotic. (4) Wounds of cornea, conjunctiva, or sclerotic.

1. **Contusions of the Eye** may cause a great variety of intra-ocular changes, many of them very severe. A guarded prognosis should be given till a complete examination (both with the ophthalmoscope and by testing the sight) can be made.

The patient must be kept at rest, and the eyes protected from the light by dark glasses. If there be pain or hæmorrhage, cold compresses should be used for the first twenty-four hours, but after the risk of further hæmorrhage taking place is over (generally in forty-eight hours), hot applications should be substituted to help the absorption of the blood. Weak atropine drops (1 or 2 gr. to the ounce) should be used till all danger of inflammation has passed. If iritis or cyclitis supervenes, it must be treated energetically (*see* IRITIS).

Iridodialysis.—Nothing further than the above treatment is necessary.

Paralysis or Rupture of the Sphincter Iridis, or *Paralysis of the Ciliary Muscle.*—In none of these conditions is atropine advisable unless indicated by other complications. Some recommend atropine to be used in the other eye to prevent consensual action.

Dislocation of Lens.—With dislocation of the lens the refraction is always changed. If the eye quiets down and the lens remains behind the pupil, the eye as a rule becomes myopic, and a correcting lens may be of service ; after dislocation into the vitreous, a strong convex lens may improve vision. A lens dislocated into the anterior chamber should be removed. *Secondary Glaucoma* may occur (*see* GLAUCOMA), or *Cataract* may *supervene* (*see* CATARACT).

Intra-ocular Hæmorrhages.—Rest, dark glasses, cold compresses for twenty-four hours, followed by hot applications, weak atropine drops (1 or 2 gr. to the ounce) three times a day.

If the hæmorrhage causes rise of tension, the patient must be kept in bed, two leeches be applied to the temple, and a brisk purge given ; eserine should not be used, and weak atropine may be tried tentatively, but if the tension does not come down, atropine should be withheld.

Rupture of the Sclerotic.—(*a*) Without laceration of the conjunctiva. The above treatment is all that can be given—rest, leeches, atropine, etc.—the main indication being the treatment of the consequent traumatic iridocyclitis. If the lens be dislocated under the conjunctiva, it should be left alone, when it will probably become absorbed. (*b*) If laceration of the conjunctiva has occurred, in addition to the above treatment the eye should be carefully washed out and dressed regularly with the strictest antiseptic precautions. In either case, if the eye is not quieting down in a fortnight's time, or has become a useless organ, it should be removed. In cases where the eye is clearly destroyed at the time of the injury, it should be enucleated at once.

2. **Abrasions of the Cornea.***—The conjunctival sac should be washed out with warm boracic lotion, a little atropine ointment (1 gr. to the ounce) inserted between the lids, and the eye kept tied up till the surface has healed. If there is photophobia, a shade may be worn over the good eye, or dark glasses be used, a pad of wool sufficiently thick to keep the lid shut being placed between the glass and the bad eye.

3. **Foreign Body in the Cornea or Sclerotic.**—After anæsthetizing the surface with a 2 per cent solution of cocaine, the foreign body is removed with a sterilized needle or spud, care being taken to injure the surrounding tissue as little as possible. (If pieces of hot iron from an emery wheel are embedded in the cornea, the ring of brown stain usually met with should also be removed.)

When the foreign body is so deeply embedded in the cornea that there is danger of its being pushed into the anterior chamber, a broad needle is passed into the cornea behind the foreign body, and the latter can then be removed without risk. If it is projecting into the anterior chamber, the broad needle must be passed into the chamber behind the foreign body, and kept pressed up against the back of the cornea till it is removed.

After-treatment.—The conjunctival sac should be well washed out with warm boracic lotion, atropine drops (2 gr. to the ounce) instilled, and a pad (cyanide Gamgee) and bandage worn until the eye is quiet and the surface healed. If irritation persist, and if

* The detection of an abrasion is greatly facilitated by the use of a solution of fluorescein 8 gr., sodium bicarbonate 12 gr., to the ounce. One drop is instilled into the eye, followed by a few drops of boracic lotion or solution of cocaine. The abraded surface stains *green.*

any signs of iritis occur, the use of atropine must be continued till the eye has completely quieted down.

Should the cornea become infiltrated, *see* CORNEA, DISEASES OF.

4. **Wounds (without Perforation) of Cornea, Conjunctiva, and Sclerotic.**—Uncomplicated wounds of the cornea are treated like abrasions, viz., by washing out the conjunctival sac, and instillation of atropine, the eye being kept bandaged till the surface has healed. Wounds of the conjunctiva heal readily. If laceration has taken place, the cut edges should be sutured with fine sterilized silk, and the eye tied up till healing is complete. Wounds of sclerotic: if the wound gapes, the edges should be sutured (*vide infra*).

II.—INJURIES WITH PERFORATION.

Penetrating Wounds are always of extreme importance, not only from damage done by the injury itself and by the consequent inflammation, but from the possible danger to the other eye of sympathetic ophthalmitis. The signs of penetration are, the presence of a wound, escape of vitreous or prolapse of uvea, a shallow or a too deep anterior chamber, loss of tension of the eye, hæmorrhage into the vitreous, and impaired vision. In treating penetrating wounds, therefore, we have to find out: (1) How far the injured eye is likely to be a useful visual organ; and (2) How far it is a menace to its fellow. In answering these questions five considerations are very important.

i. *Does the Eye contain a Foreign Body?*—If so, not only will it almost certainly be lost from iridocyclitis, but it is a danger to its fellow. Therefore, as a general rule, such an eye must have the foreign body removed, or be itself removed. (N.B.—A foreign body is tolerated best in the lens. Of foreign substances found in eyes, glass seems to be the least irritating; while of metals, iron and copper, especially the latter, are very irritating.)

ii. *Has Septic Matter been introduced?*—If so, the eye will in all probability be lost from iridocyclitis or panophthalmitis. Chronic iridocyclitis following a penetrating injury is very liable to cause sympathetic trouble in the other eye. Panophthalmitis, while causing complete loss of the eye, does not as a rule cause any sympathetic mischief.

iii. *Is the Lens injured?*—This is discovered on careful examination by oblique illumination and with the ophthalmoscope after dilatation of the pupil.

Traumatic cataract will almost certainly follow, and hence binocular vision will be lost: for however well the eye quiets down and the opaque lens is absorbed or artificially removed, an eye supplemented by a strong convex glass, in place of its own lens, will practically never work with its uninjured fellow. On the other hand, though binocular vision is lost, an eye without a lens is very useful, in that it enlarges the field of vision on a side which would otherwise be blind, and thus gives invaluable assistance in crossing streets, driving, etc.

If the wound in both lens and cornea be large, the lens capsule is very likely to be entangled in the corneal wound, and as this cannot be recognized directly after the injury because of the transparency of the capsule, it cannot be removed. It is now generally accepted that entanglement of the lens capsule in the wound is nearly as dangerous in its liability to cause sympathetic ophthalmitis as entanglement of uveal tissue (*vide infra*).

An eye whose lens has been injured takes a long time to quiet down, since it has the double work of recovery from the trauma and the absorption of the lens.

From these three considerations we see that though a reasonable attempt should be made to save an eye with an injured lens, yet it is not justifiable to run the same risk as in trying to save one with an uninjured lens.

iv. *Is there Prolapse of Iris, Ciliary Body, or Choroid?*—A protrusion of any part of the uveal tract on the surface of the eye, since it is liable to direct infection from without, is very dangerous from the point of view both of sympathetic ophthalmitis and panophthalmitis. The more completely these protrusions can be removed the greater is the chance of recovery. Hence, prolapse of the iris, being more easily separated and excised, is less serious than prolapse of the ciliary body, where freeing of the wound from all entanglements is seldom possible. A wound in the ciliary region with prolapse of the ciliary body is the most dangerous of all penetrating injuries. A prolapse which cannot be removed, even if the eye quiet down after the injury, is always a possible source of danger, and must be looked upon as a serious condition.

v. *Is there Displacement of the Contents of the Eye?*—When there is displacement or loss of the lens, prolapse of retina, etc., in addition to the external wound, enucleation should be performed at once ; but if there appears any chance of retaining a useful organ, tentative treatment may be tried (*vide infra*).

Having given the main indications for forming an opinion as to whether the injured eye is likely to be useful or useless, safe or dangerous, we will consider the treatment of these various complications.

Foreign Body in the Eye.—The presence of a foreign body may be surmised from :—

a. The History.—What struck the eye ? What was the patient doing when the eye was struck ? (E.g., if the patient was hammering or chopping, and something small, which was not afterwards found, struck the eye, it is very possible a small chip of metal entered the eye.)

b. The Appearance of the Eye.—By careful oblique illumination a minute track may be discovered through the cornea or lens, or a small gap seen in the iris ; or again, the ophthalmoscope may reveal a track through the lens or vitreous, a scar on the retina, or even the foreign body itself.

c. X-ray Photograph.—This may show the presence of a foreign body.

d. Use of Haab's Magnet.—If pain be experienced on bringing the eye close to one of these powerful magnets, there is strong evidence of the presence of a piece of iron.

If a foreign body is visible it must be removed, either with the magnet or forceps, according to its nature. If invisible, it must be carefully localized by means of *x*-ray photographs. If it is a chip of iron it should be removed with a strong electro-magnet ; if of some non-magnetic material, its removal with forceps should be attempted, though the chance of success is small.

For after-treatment, *vide infra.*

Septic Wounds.—Here little can be done to save the eye. If panophthalmitis has set in, evisceration of the globe should be performed without delay. The eye should not be excised in the ordinary way with division of the optic nerve, for the danger of meningitis after enucleating a suppurating eye is a very real one, being brought about by infection of the vaginal sheath of the nerve by the scissors with pus which has escaped from the eye. Either (1) Ordinary evisceration may be performed, leaving the sclerotic ; or (2) After evisceration the bulk of the sclerotic may be removed, leaving only a frill attached round the intact optic nerve.

1. The cornea is first removed, and the contents of the globe are then completely scooped out, the sclerotic being left to shrink up. This is a tedious process, lasting fourteen days or more.

2. In the 'frill operation', having removed the cornea, two or three pressure-forceps are attached to the cut edge of the sclerotic. After evisceration, great care being taken to wipe out the globe perfectly clean with small pieces of gauze held in pressure-forceps, the sclerotic is packed with a strip of gauze so as to render the division of the muscles more easy. The muscles are now divided in the ordinary way, the gauze is removed, and the sclerotic is drawn forwards and cut through far back with strong, sharp scissors, leaving a narrow frill around the nerve. This operation has the advantages that healing is as rapid as with an ordinary excision, and, as the nerve-sheath has not been divided, all risk of infection is avoided.

When only the anterior chamber is infected and contains pus, and there is no sign of pus in the vitreous, an attempt may be made to disinfect the eye by washing out the anterior chamber with normal saline, chlorine water, or hydrogen peroxide. (For after-treatment, *vide infra.*) It is, however, seldom successful in preventing panophthalmitis, and the eye has usually to be excised or eviscerated.

If chronic iridocyclitis occurs, and does not subside at the end of ten days or a fortnight, the eye should be excised, especially if the cornea has become hazy, the iris muddy, and spots of keratitis punctata are seen on the back of the cornea.

In cases where there is no entanglement of uveal tissue or lens capsule, and the cornea and iris remain bright, we may wait a little longer ; but three weeks must be taken as a limit beyond which it is unsafe to temporize.

Wounds of the Lens.—*Clean Punctured Wounds* of the lens often give rise to no trouble beyond the traumatic cataract which almost invariably follows any injury of the lens capsule.

Atropine drops should be given to keep the pupil dilated, to allow soft lens matter to come forward into the anterior chamber, and to prevent the formation of posterior synechiæ. If iridocyclitis set in, it must be treated in the ordinary way, with rest, atropine, hot bathing, etc. If soft lens matter collect in the anterior chamber and cause increased tension, it must be let out by a curette evacuation.

Large Wounds of both Cornea and Lens as a rule do badly; the eye usually does not quiet down, and has to be removed. The wound must be freed from all entanglements or prolapse of uveal tissue or lens capsule as far as possible, any soft lens matter which has collected in the anterior chamber should be let out, and an attempt made to save the eye. For after-treatment, *vide infra.*

In all wounds of the lens the danger of entanglements of lens capsule must not be forgotten (see above), and if the inflammation is not subsiding in two weeks' time, enucleation is the safest course. At times the eye does well up to a certain point, the cornea and iris remaining bright, but still some irritability and congestion remain; in these cases, if a tag of capsule is seen adherent to the wound, division of this will sometimes allow the eye to recover completely.

Prolapse of Uveal Tissue.—The chief danger being infection of the uveal tract from without, through the prolapse itself, our main object must be—(1) Either to remove the prolapse so completely that no trace of uveal tissue remains either on the surface, included in the wound, or even adherent to the back of the wound (the first is the most, the last is the least, dangerous condition); or (2) If it is impossible to remove the prolapse, we must endeavour to separate that portion of the uveal tissue incarcerated in the wound from the rest of the uveal tract.

Prolapse of Iris.—a. In cases seen directly after the injury, a general anæsthetic should always be given; the conjunctival sac is carefully washed out with boracic lotion, all lymph adherent to the wound being thoroughly removed; the prolapse is picked up with forceps, gently freed all round from the lips of the wound with the repositor, and then drawn out as far as it will come, and cut off close to the cornea. We hope by this means that the iris, after being cut, will retract free from the wound. (In drawing out the iris a second pair of forceps is often of great use to grasp the iris close to the cornea and pull it out still further, after the first pair has done all it can.) Any remaining tags of iris are removed or replaced.

If forceps have to be introduced into the anterior chamber to remove tags of iris, and the lens is not already injured, great care must be exercised lest the lens capsule be divided accidentally with the forceps, and a traumatic cataract supervene—a most disastrous accident.

b. When firm adhesions have formed, a prolapse cannot be removed; but a skilful operator may be able to free the iris up to ten days after injury. If the adhesion be small and not close to the periphery, it may be divided by a cutting needle introduced into the anterior chamber. If near the periphery, a linear knife may be passed across the anterior chamber and the base of the prolapse cut across, followed by an iridectomy, so as to free the adherent portion of the iris from its attachments. For after-treatment, *vide infra.*

Entanglements of Iris.—Where the iris is only entangled in, or adherent to, the wound, and there is no prolapse on the surface, there is, after the wound has healed, no direct communication from the surface to the uveal tract. These cases are therefore much less serious than cases of prolapse. On the other hand, it is well known that though wounds with entanglements often quiet down well, yet they do not do this so quickly as wounds with no entanglements or where these have been freed. Hence, as a guiding rule, if at the time of the injury the entanglement can be easily freed, this should be done, either with a cutting needle introduced into the anterior chamber, or by an iridectomy through the wound. If this is impossible, the eye should be treated in the ordinary way, with rest, a pad and bandage, atropine, etc. (*vide infra*), and be given a chance of quieting down. If it does not do this in a fortnight's time, and the pulling of the iris appears to be the only cause of irritation, division of the synechia or iridectomy should be undertaken.

Prolapse of the Ciliary Body and Choroid.—These cases are more dangerous than those with prolapse of iris, because of the difficulty of freeing the prolapse. A prolapse of the ciliary body or choroid which is not obviously infected or lacerated should in recent cases be pushed back, and the sclerotic brought together with sutures (*vide infra*). If, however, laceration has taken place, or infection is probable, the prolapse should be drawn out with forceps and excised as in the case of the iris, and the sclerotic sutured. When four or five days have elapsed since the injury, the prolapse cannot be removed, and must therefore be left.

In either case, whether the prolapse has been removed or not, we must fully recognize that we are dealing with a condition the most dangerous of all in its liability to cause sympathetic ophthalmitis. If the other eye is sound, we are not justified in running any serious risk in trying to save its injured fellow, lest in our endeavour to save the one we lose both. Should the eye, therefore, not begin to improve in a week or ten days, it had better be excised.

Wounds of the Sclerotic.—Where it is thought desirable to try to save an eye with a gaping wound of the sclerotic, with prolapse of ciliary body, choroid, or vitreous, we proceed as follows: After anæsthetizing either locally or generally, the conjunctival sac should be washed out, the uveal tissue pushed back or excised, the vitreous snipped off, and the sclerotic brought together with sutures. These are passed in the following way: We use a double-needled suture of fine sterilized silk, and having grasped the sclerotic firmly with toothed forceps to prevent further loss of vitreous, we pass each needle from within outwards, not quite through the whole thickness of the sclerotic, and then through the cut edge of the conjunctiva, taking care not to include any uveal tissue in the suture or in the lips of the wound. In this way the whole wound is brought firmly together with as many stitches as are necessary.

After-treatment of Penetrating Wounds.—The conjunctival sac is carefully washed out both before and after any operation. Sterilized atropine drops are instilled, or atropine ointment inserted between the lids. Strict asepsis is observed throughout. A pad of cyanide Gamgee tissue is used as dressing, and the eye is bandaged. Two leeches are applied to the temple, a purge is given, and absolute rest in bed is enjoined. The eye is dressed daily, and the use of atropine continued till all danger of inflammation is over.

If iridocyclitis supervenes, more energetic treatment must be adopted, viz., atropine three times a day, hot applications, further leeching, light diet, etc. (*See* Iritis.)

If the eye quiets down in a fortnight or three weeks, it may be saved; but if after the first week it gets steadily more red, and especially if the cornea becomes hazy, the iris muddy, and spots of keratitis punctata appear on the back of the cornea, it should then be excised without further delay.

It is usually considered that we are safe from sympathetic mischief for about three weeks after an injury, but symptoms have occurred within ten days, which fact points to the process having begun even earlier; so that unless there appears to be a good chance of saving a useful eye, we are not justified in postponing excision beyond ten days or a fortnight. Too great a risk must not be run, lest blindness in both eyes be the result.

[*W. Tindall Lister.*

EYELIDS, DISEASES OF.

Meibomian or Tarsal Cyst (Chalazion) is a benign neoplasm identical in structure with granulation tissue. In the earliest stages of these little growths, hot boracic bathing and the use of ung. hydrargyri oxidi flavi, 4 gr. to the ounce, will sometimes lead to their absorption. Failing this, should the tumour prove disfiguring, or cause discomfort, it should be removed by incising and scraping. This may be done under a local anæsthetic or under gas and oxygen. When the cyst is in the tarsus itself and there is little inflammation, cocaine is quite sufficient; but when the cyst has come forwards between the tarsus and the skin, or when there is much inflammation, it is wiser in sensitive subjects to give a general anæsthetic (gas and oxygen) and to make sure of removing the tumour thoroughly, than to cause a great deal of pain, to have to desist, and for the tumour to recur. If a local anæsthetic is decided on, after a few drops of 2 per cent cocaine solution have been instilled into the conjunctival sac, the lid must be everted and a few crystals of

solid cocaine applied to the conjunctiva immediately over the swelling.* An injection of novocain in addition under the skin and into the tarsus gives good anæsthesia when there is no marked inflammation. Using a Beer's knife, a free vertical incision should now be made, and the granulation tissue removed by a thorough scraping with a small scoop until, on manipulation, no tumour can be felt. It is most important that all this tissue be removed; otherwise the swelling will most certainly recur. Sometimes these growths are exceedingly hard and fibrous, and quite impossible to remove by scraping. They should then be dissected out, either from the conjunctival surface, or, if they project forwards, through the skin of the lid—in the latter case a subcutaneous injection of novocain and adrenalin is useful.

The small marginal chalazia which occur at the border of the lid should be shaved off level with the surface, and scraped.

Occasionally large numbers of chalazia occur, and in successive crops. In such cases treatment by vaccines prepared from the infected cysts is sometimes very efficacious.

Hordeolum (Stye) is an inflammation of the ciliary follicle, and is frequently associated with a lowered state of health or some error of refraction. In its treatment, therefore, the health of the patient must be inquired into, and suitable tonics given. The refraction must also be carefully investigated, and glasses ordered if necessary.

Locally, in the early stages, epilation of the eyelash corresponding to the inflamed follicle, followed by hot boracic bathing and the application of ung. hydrargyri oxidi flavi, 4 gr. to the ounce, will often cut short the attack. If pus develops, a small incision must be made, and hot fomentations be applied until all swelling has subsided. If crops of styes occur, treatment by vaccination is advisable.

Ptosis, or drooping of the upper lid, may be congenital, paralytic (third nerve or sympathetic), or the result of long-standing inflammation, e.g., trachoma.

Congenital Ptosis.—Slight cases of this condition require no treatment, but if more than half of the pupil is covered by the lid, an operation is indicated. When the levator palpebræ has no power, of the many plans devised to rectify the deformity, those of Hess, Mules, and Panas give the best results. When, however, the levator can raise the lid partially, though insufficiently, an advancement of this muscle may bring about an almost perfect cure.

Paralytic Ptosis.—When resulting from paralysis of the third nerve, a course of general treatment directed against the constitutional cause should be carried out. In the slight form resulting from sympathetic paralysis, no local treatment is necessary, as the drooping of the lid is never sufficient to interfere with sight. When due to myasthenia, treatment so far is of no avail.

Inflammatory Ptosis.—In these cases we must, of course, treat the disease which is giving rise to the deformity.

Epicanthus.—Only in extreme degrees of this congenital abnormality is operative interference justified, for the deformity tends to lessen or disappear with the development of the bridge of the nose. In such extreme cases a vertical ellipse of skin should be excised from the dorsum of the nose.

Blepharitis.—Clinically we meet with two well-defined groups of cases.

1. *Blepharitis Squamosa.*—Characterized by the presence of branny scales along the margin of the lid which, when removed, expose a hyperæmic but not ulcerated surface. The condition is one of seborrhœa, and is usually associated with a like condition of the scalp which will need treatment.

Very frequently some refractive error which causes congestion of the lids is the chief etiological factor, and this should be corrected by suitable glasses; at the same time the general health must be inquired into, and treatment adopted when necessary.

Locally, strict cleanliness, the removal of the scales by the frequent use of an alkaline lotion, e.g., sod. bicarb. 10 gr. to the ounce, or sod. bicarb. 4 gr., liq. picis carbonis 10 min., aquam ad 1 oz., but this lotion must not be allowed to get into the conjunctival sac; and anointing the lid margins night and morning with a mercurial ointment, e.g.,

* Only a very few crystals should be used, and the lid should be kept everted and as dry as possible to prevent a strong solution passing down the duct into the throat, as alarming symptoms from cocaine poisoning have occurred after too free a use of the solid salt.

ung. hydrargyri oxidi flavi, 4 gr. to the ounce, or ung. hydrargyri nitratis dil., is all that is necessary.

2. *Blepharitis Ulcerosa.*—Here the lid margin is covered by firmly adherent yellow crusts which, on removal, expose an ulcerated surface. This is a much more severe form of blepharitis, and may lead to permanent malformation of the lid, or destruction of the ciliary follicles. As in blepharitis squamosa, the general health and refraction must first be carefully investigated. In the severer forms of this disease it is a good plan to commence treatment by epilating the lashes in the affected areas, and, after a thorough cleansing and removal of the scales, to paint the lid margin with a solution of silver nitrate, 10 gr. to the ounce, or protargol, 100 gr. to the ounce. Subsequently, frequent bathing with an alkaline lotion and anointing the lid borders with a weak mercurial ointment must be energetically persevered with.

In the worst forms of this disease, when the lids are thickened and rounded, and epiphora from stenosis or eversion of the puncta is a marked symptom, it becomes necessary to slit up the lower canaliculus for the outer two-thirds of its extent.

Entropion or Inversion of the Eyelids.—*Spasmodic Entropion* of the lower lid is met with most frequently in old people, and is particularly liable to occur if the eye has been bandaged. In the slight cases, it is generally sufficient, after dispensing with the bandage, to evert the lid into its normal position and fix it by means of strapping. Equally good results may be obtained by painting the skin of the lower lid with collodion, or pinching up a horizontal fold of skin and transfixing it with two or three vertical sutures, which are tied and allowed to remain until they cut their way out.

In the severer forms of this condition, the above methods are insufficient, and it becomes necessary to remove a narrow strip of skin and orbicularis muscle. After a subcutaneous injection of novocain and adrenalin, a horizontal fold of skin as near the lid margin as possible is picked up with forceps and excised with a pair of scissors. A fold of the underlying orbicularis muscle is then removed in a similar manner. Sufficient skin and muscle must be removed to prevent any return of the entropion on squeezing the lids at the time of operation, but not so much as to cause any ectropion. A somewhat greater effect can be obtained by removing in addition a small vertical portion of skin and muscle at the outer end of the horizontal incision, thus shortening the lid. After taking care to arrest all hæmorrhage, a few sutures are inserted and the wound is dressed with gauze.

Cicatricial Entropion.—The most common etiological factors in this form of entropion are trachoma and the cicatrization following burns. An operation is necessary to correct the deformity, and one of three procedures is commonly adopted: (1) Restoring the incurved tarsal cartilage to its normal position—Streatfeild's or Burow's operation. (2) Transplantation of the lash-bearing portion of the lid—Arlt-Jaesche. (3) Removal of the lash-bearing portion of the lid.

Ectropion or Eversion of the Lid.—*Senile Ectropion.*—In the milder cases of this condition, it is important to direct the patient, when wiping his eye, always to pass the handkerchief from below upwards, and so avoid the lid being still further dragged away from the eyeball. The conjunctiva must be carefully treated with astringents (e.g., guttæ zinci sulph., 1 gr. to the ounce), and the application of silver nitrate, 10 gr. to the ounce, twice weekly. Failing this, an effort may be made to replace the everted lid by the cauterization of the conjunctiva with the actual cautery and slitting the outer two-thirds of the canaliculus. In the severer forms, when the lid is much everted and the exposed conjunctiva redundant and thickened, a more extensive operation is indicated, as Snellen's suture, or Argyll Robertson's or Tweedy's operation.

In *Paralytic Ectropion*, from paralysis of the orbicularis palpebrarum muscle, slitting the canaliculus and removal of the inner wall should first be tried, but will probably prove insufficient; it then becomes necessary to shorten the lower lid by a suitable operation.

Cicatricial Ectropion is the most intractable form of ectropion with which we have to deal, and may result from cicatrization following burns, wounds, cellulitis, lupus, etc. An operation is always necessary, and the procedure to be adopted must of necessity vary with the amount of destruction of the parts, and often requires much thought and ingenuity.

Ilbert Hancock.
(*Revised by W. T. Lister.*)

FACIAL PARALYSIS (Bell's Palsy).—Treatment varies according to the cause. In syphilitic cases administer mercury and iodide of potassium. Cases due to suppurative conditions of the middle ear, implicating the nerve within the Fallopian aqueduct, must have the area of suppuration promptly treated in order to prevent total destruction of the nerve. In wounds of the face or neck, which have divided the nerve after its exit from the stylomastoid foramen, primary suture of the nerve-trunk must be performed.

By far the commonest, however, is the so-called 'rheumatic' variety. In such a case, a fly-blister should be applied over the front of the mastoid process, as nearly as possible over the site of the stylomastoid foramen, and diaphoretic medicines and a smart purge administered, whilst protecting the patient against chills. Sometimes there is considerable pain at the onset of these 'rheumatic' cases. This can usually be allayed by phenazone in 10-gr. doses, repeated if necessary. The time of reappearance of motor power varies according to the severity of the inflammation of the nerve. In any case, until motor power begins to reappear, the paralyzed muscles should be stimulated several times a day with the continuous current, for about a quarter of an hour at a time, in order to maintain their nutrition. This the patient should be taught to do for himself, sitting in front of a mirror, so as to see that the muscles actually contract. The negative pole is stroked gently along the muscles, radiating in different directions forwards from the ear, whilst the positive pole is placed on the back of the neck or some other 'indifferent' spot. The galvanic current should be moderate in strength, just enough to produce distinct muscular contraction. The patient must persevere scrupulously with this treatment daily, until voluntary power begins to return.

The paralyzed muscles tend to become stretched by the weight of the face, together with the pull of the unopposed muscles of the opposite side, thereby retarding the recovery of voluntary power. This stretching can be prevented to some extent by placing a light loop of metal, e.g., a bent hair-pin, in the angle of the mouth, and attaching it by means of a strip of elastic to a silken loop around the ear, adjusting the tension so as to correct the deformity of the mouth. Recovery is thereby hastened. Gentle massage, especially vibratory massage, of the paralyzed muscles, should also be practised every day. Under this régime most cases of 'rheumatic' facial palsy gradually recover more or less completely.

But there remains a certain proportion of cases which, in spite of massage and electrical treatment, show no signs of recovery. These are chiefly cases secondary to otitis media, or traumatic cases following operation, injuries, or fractures of the base of the skull. Until recently such cases were regarded as incurable ; but within the past few years a number have been recorded in which the operation of nerve-anastomosis has yielded encouraging results.

I have elsewhere, in conjunction with Sir C. and Sir H. Ballance, and also with Sir L. Cheatle, recorded cases where the following procedure was carried out :—

The facial and hypoglossal nerves are exposed, the facial nerve is cut across as high as possible, close to the stylomastoid foramen, and its distal segment is turned down and united by sutures to the hypoglossal, either to its side (end-to-side) or the hypoglossal is divided and its central segment united (end-to-end) to the distal segment of the paralyzed facial. The result of this procedure is that within a few weeks the facial nerve begins to regain voluntary motor power. At first this is only manifested when the patient tries to move his tongue, but later the patient learns to perform dissociated facial movements independent of the tongue ; and finally even emotional movements, such as smiling, can be accomplished by the face through the new channel of the hypoglossal. The corresponding half of the tongue, of course, undergoes atrophy, but this causes the patient no appreciable inconvenience. The original cases by Sir C. Ballance and myself were done by facio-accessory anastomosis, but later cases, in which the hypoglossal was selected instead of the spinal accessory, have convinced us that facio-hypoglossal anastomosis is the better operation of the two.

There remains a further question : In what cases are we justified in recommending treatment by nerve-anastomosis ? In other words, how long are we to wait before regarding a case as incurable without operation ? I believe a good rule is to persevere faithfully with electrical treatment and massage for at least six months. If after that period no signs of return of voluntary motor power have appeared, we should recommend

operation. Of course, in cases where, from traumatism, one knows that the nerve has been definitely cut across, and where it is impossible to join the upper and lower segments by primary suture, one should not wait, but should perform facio-hypoglossal anastomosis without further delay. (*See also* ELECTROTHERAPEUTICS, and NERVES, PERIPHERAL.)

James Purves Stewart.

FACIAL SPASM (Facial Tic or Histrionic Spasm).—This disfiguring malady consists of clonic spasm of the facial muscles, and may be confined to a muscle supplied by one branch of the facial nerve or to one group of muscles, or may involve the whole of those of the affected side of the face. It is due to central causes, but perhaps also to irritation of branches of the fifth nerve.

General treatment, massage, nerve tonics, and sedatives have usually been tried before the patient is brought to the care of the surgeon. Careful treatment by graduated exercises should be instituted (*see* TICS). Failing relief from these procedures faithfully carried out, 2 c.c. of 80 per cent alcohol should be injected into and around the facial nerve at its exit from the stylomastoid foramen. This will produce a temporary paralysis of the muscles supplied by the nerve. If this also fails to cure the condition, division of the nerve at the stylomastoid foramen, followed by anastomosis to the hypoglossal, is the only treatment which holds out hope of success.

James Sherren.

FAVUS.—It is a very easy matter to lay down the principles of treatment for this disease, for they are summed up in two words—epilation and antiseptics. Until recently, however, practice lagged long behind principle, and the cure of a widespread case of favus was rare. The barbarous pitch-cap of the Middle Ages was replaced by more humane but less efficacious methods, and it was not until the value of the *x* rays as a depilatory began to be recognized and taken advantage of, that one undertook with any confidence the treatment of favus. With their assistance one may hope to cure the most extensive case in not more than six months. The only essential is that the application be sufficient without being overdone. The method of affection of the hair makes epilation more thorough and much easier than in ringworm, and in a month the scalp should be absolutely bald. During this month, and even more after it, energetic local antiseptic treatment should be employed, so that the fragments of fungus still lurking in the empty and now open follicles may be destroyed before the new hair, which very soon begins to grow, becomes affected. Resorcin is strongly recommended by many, while various copper salts, such as the oleate and the sulphate, and white precipitate and other mercurial ointments, also have their advocates. The following prescriptions are suitable :—

R	Cupri Sulphatis	℥j	Adipis Benzoati		℥ij
R	Resorcini	℥j	Lanolini Vaselini		āā ℥j

Sig. To be well rubbed into the whole scalp twice a day.

Whichever be selected, the essential condition for success is that it be thoroughly massaged into the scalp, and thus into the empty follicles.

Norman Walker.

FEVERS, ACUTE INFECTIOUS (General Treatment).—To avoid repetition it is proposed to deal in this section with such matters of treatment as are common to all the acute infections.

The patient who presents symptoms of one of these diseases should at once be confined in a room by himself, and if necessary ordered to bed. It is hardly possible to insist too strongly upon these measures, in the interests not only of the patient, but of those around him. When the symptoms are inconclusive, a few days will, in the majority of cases, determine the nature of the illness and the necessity for further isolation.

The room should be airy, with free ventilation and ample windows, and have preferably a southern aspect. If it is situated on the ground floor or provided with a balcony, so much the better, for in fine weather the patient can be wheeled or carried into the open air long before he is able to get up and walk. The upper sash of the window should be kept constantly more or less open, according to the state of the weather, care being taken so to place the bed that the patient does not feel a draught. The temperature

of the room should not, if possible, be below 55° or above 65°, but should be equable. Even in warm weather a small fire will be required, not only for heating food or drink, but for burning articles that have been used in the treatment, especially in cases of diphtheria, scarlet fever, chicken-pox, and erysipelas.

Before the patient is moved into the room, all valuable and unnecessary articles of furniture or ornament should be taken out, to avoid the risk of damage afterwards by disinfection. A small expenditure will make a room look cheerful with objects that can be destroyed when they are no longer required. Plants and cut flowers may be allowed, but the latter should be removed at night and renewed daily.

If circumstances permit, two rooms should be allotted to the patient, to be occupied and thoroughly aired alternately day and night. In diphtheria and typhoid fever, however, it is usually undesirable to move the patient more than is absolutely necessary, and one room must suffice.

During the febrile stage the patient requires but slight bed-covering—a single sheet, or a sheet and light counterpane. When convalescence is reached, blankets may be added. For children, and for adults when there is a risk of soiling the bed, as in delirium or coma, a mackintosh sheet should be placed beneath that on which the patient lies. In prolonged cases of fever, a draw-sheet and mackintosh draw-sheet should also be used. The nurse should be particularly enjoined to be careful that there are no creases in the sheets beneath the patient.

In typhoid and other prolonged fever cases in adults, it is very convenient to use nightgowns that can be opened front and back, or better still at each side. This arrangement facilitates the daily washing by the nurse and examination by the medical attendant. During the period of fever a single linen garment only is necessary.

Those in actual attendance upon the patient should not mix with other members of the household or with the outside world without taking precautions against the spread of infection, by wearing a washable outer garment or overall in the sick-room, and by thoroughly cleansing the hands on leaving it. To hang outside the door a sheet soaked in some disinfectant is not necessary, but is useful as a warning to unauthorized visitors. Visitors to the patient must take the same precautions to prevent the spread of infection as those in attendance upon him. Dirty clothing and bed-linen should be placed in a metal receptacle and removed for disinfection by the sanitary authority every day. Soiled linen should, if possible, be steeped in antiseptic liquid before removal; this is especially desirable in typhoid fever. The nurse should be directed to mix some strong liquid disinfectant with the excreta before throwing them into the drain.

At the end of the illness the room and its contents must undergo thorough disinfection, which is best carried out by the sanitary authority under the direction of the Medical Officer of Health. The floor and woodwork should be scrubbed, first with soap and water, and afterwards with some disinfectant. The walls should be submitted to the same process, unless they have been covered with paper that washing will destroy, in which case they must be repapered. The ceiling must be rewhitened. Bedding, clothing, carpets, and books must be submitted to the heat of steam under pressure. Articles made of leather, skin, or fur are ruined by this form of heat; for them dry heat will in most instances be sufficient. Metal and wooden articles must be washed with a disinfecting solution.

One of the results of fever (save in attacks of very short duration) is wasting, often rapid and considerable. First the reserve fat is lost, later the protein of the tissues. One of the causes of wasting is the continued low diet to which it has been the fashion to restrict fever patients. It has been shown by Chittenden and others that the waste of protein can be minimized by increasing the proportion of hydrocarbons and carbohydrates in the food. It is, therefore, not advisable to keep a patient for too long a time on purely a milk diet. While milk (2 pints) should form the staple, eggs, cream, butter, bread, cereals, sugar (especially lactose), and potatoes, should be added. The object should be to provide a diet which shall be the equivalent of 3000 to 4000 calories a day. Monotony may be avoided by flavouring the milk with tea, coffee, cocoa, or chocolate; or a cup of these beverages may be given two or three times a day. Custard, junket, and milk jelly are agreeable variations. There are, however, cases in which for special reasons the diet must be restricted for a time to milk. When there is frequent vomiting, or curds are passed

in the stools, milk alone should be given, and it should be peptonized. In very severe cases it may be necessary to limit the diet to whey or albumen-water. A few persons loathe milk, and cannot take it. For them a milk-free diet, of which gelatin is one of the chief constituents, may be ordered. The gelatin should be dissolved in water, 1½ oz. to a quart, and flavoured with lemon, etc.

Thirst is a very common complaint in fever, and there is no objection to letting the patient drink as much water as he likes. The juice of two lemons should be taken with the water daily. In severe cases of fever it is rare to find the patient hungry, so that it is unnecessary to consider the question of giving solid food till the stage of convalescence is approached. The patient's appetite is then the best guide, and by short stages the usual diet of health is soon reached. When the attack is mild, there is no objection to a fish diet (fish, bread and butter, potato, rice pudding, etc.) during the earliest period.

Beef-tea, gravy, and meat soups are undesirable during the febrile stage, except as a change, and then only in small quantities and not concentrated. The extractives they contain throw too much work on the kidneys.

In serious cases of fever, stimulation of the heart will almost certainly be required sooner or later; and the answer to the question, What is the best stimulant? largely depends upon the disease and the patient. In adults suffering from typhoid or typhus fever, for instance, the application of cold water to the skin is an excellent stimulant; but in children this measure should be used with caution. The cause of the cardiac failure in toxic diphtheria is fatty degeneration of the heart-muscle, often extreme; and in many cases stimulants are absolutely useless, because there are not enough healthy muscle-fibres left to respond. But subject to some observations to be made below as to the use of cold water, the writer is of the opinion that the most valuable cardiac stimulants are strychnine, quinine, and wines and spirits. Camphor, also, is by no means to be despised. If, in a prolonged case of fever, the medical attendant finds signs of slowly increasing failure of the heart, he will prescribe liquor strychninæ, 3–5 min., or sulphate of quinine, 1–3 gr., or spirits of camphor, 5–10 min., every three or four hours. The disagreeable taste of the camphor may be disguised in port wine. Brandy, up to 4 oz. in the twenty-four hours, is also useful. With these drugs tincture of digitalis or strophanthus, or citrate of caffeine, may be prescribed with advantage. In desperate cases, good champagne (3 to 4 oz. every two or three hours) is preferable to brandy. But when cardiac failure comes on suddenly, the best stimulant is strychnine hypodermically, in doses of $\frac{1}{60}$ gr. to $\frac{1}{15}$ gr. of the hydrochloride. Hot coffee, with brandy, should be injected into the rectum. Hot applications to the precordial region, and flapping this region with a corner of a wet towel, are also efficacious measures at times. It is not necessary to give alcoholic beverages in a routine way; but if the patient has been accustomed to take wine, spirits, or beer, he may be allowed to have them in moderation during his illness, especially during the convalescent stage.

It is sound treatment at the beginning of an attack of fever, even though at the time the symptoms are doubtful, to give a purge; castor oil and calomel (up to 5 gr.) are the most suitable.

An abnormally high temperature frequently requires treatment. Before discussing the various methods which may be employed, it may be well to point out that a rise of temperature is not the only sign of fever, and that there is wide variation in the symptoms accompanying a rise of temperature. For a reason which has never appeared very clear to the writer, 102·5° has been fixed as the limit below which it is usually not needful to have recourse to antipyretic remedies. But in some patients restlessness and delirium are as troublesome with a temperature of 101°–102° as they are in others with a temperature of 103°–104°; and the writer believes that in diseases like typhoid and typhus fevers, in which the temperature is raised for many days together, the best results are not obtained by waiting till the temperature rises to 102·5° before employing such measures as baths, packs, and the like. The application of cold water to the skin in cases of fever was in use long before the invention of the clinical thermometer. When, therefore, sleeplessness, restlessness, delirium, dryness of the mouth and tongue, sordes on the gums and teeth, and a dry skin, are present, one or other of the following methods of hydrotherapy will certainly be beneficial.

Sponging.—The patient being loosely wrapped in a blanket, his trunk and limbs should

be successively exposed and sponged for about five minutes each, with a sponge partly wrung out of water. He should be left another half-hour in the blanket before being put between the sheets.

Wet Pack.—The patient's trunk and limbs are enveloped in a sheet wrung out of water. He is then laid on the bed between two blankets. At the end of the time specified, usually fifteen to thirty minutes, the sheet is taken off, the skin quickly and lightly dried with a towel, and the patient placed between warm blankets.

In the continuous wet pack, the patient's trunk and limbs, only so far as elbows and knees, are wrapped in a sheet wrung out of tepid or warm water. The extremities of the limbs should be wrapped in wool. The patient may be kept in the pack between blankets for several hours or days. The sheet, when it becomes dry, and if it is undesirable to move the patient in order to apply a fresh sheet, may be made wet again by squeezing water on it from a sponge. When it is soiled it must be changed.

Baths.—The patient is immersed, in the recumbent position, up to his neck in water. In this he is kept for five to twenty minutes. The baths should be repeated every three or four hours. It must be admitted that in a private house it is not always easy to give a bath to a patient who is very ill with fever, especially with typhoid fever. It is seldom that the bath available is sufficiently large. But it can be managed if pillows or pads are placed along the bottom and sides of the bath, and the patient is lowered into it with a sheet. To accomplish this safely in the case of an adult of average weight, three persons will be required. But the apparatus devised by Dr. Bull, of Auckland, New Zealand, a description of which follows, may be used (*Fig.* 29). "A piece of mackintosh sheeting, 8 feet by 4 feet, is taken; the sides are looped to receive stretcher poles; the latter should be at least 8 feet long, and 1½ inches in diameter. In order to apply the bath . . . the patient is gently semi-rotated so that he lies, say, on his left side and near the edge of the bed; the mackintosh sheeting, half rolled up, is introduced under him in the same way as a draw-sheet; he is now moved again on to his back, and thus lies in the centre of the sheeting. The stretcher poles are now run through the looped sides of the sheeting, and secured to the ends of the bed, if rounded, by a simple sling; if square, they rest on them. If the head and foot of the bed are not raised, a simple support of wood for the stretcher poles to rest on is all that is necessary. A pillow is now introduced under the patient's head, beneath the mackintosh, and the sheeting at the foot is secured by a safety-pin. The bath is now ready, and water of the required temperature can be introduced, in sufficient quantity, if necessary, to cover the patient's body entirely. When the bath is over, one of the stretcher poles is drawn out, and the water allowed to flow into a receptacle at the side of the bed; this it does very readily if the bed be slightly tilted. The second stretcher pole is now drawn out, and the mackintosh sheeting removed in the reverse way to that in which it was placed beneath the patient."

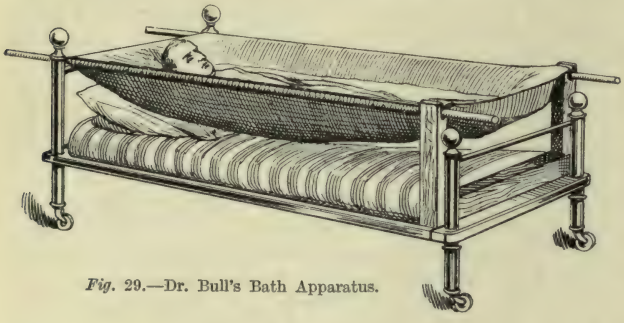


Fig. 29.—Dr. Bull's Bath Apparatus.

This apparatus can be made cheaply and quickly. It can be applied easily by two persons, and even by one.

In hospital practice a tank on wheels is very convenient for carrying out the bath treatment. The tank, 6 ft. 4 in. long, 1 ft. 8 in. wide, and 1½ ft. deep (inside measurements), is made of wood lined with zinc. It is supported on an iron frame, beneath which are four small, rubber-tired wheels; the two wheels at one end move on a pivot, so that by means of a handle at that end the tank is easily moved in any direction. In the bottom of the tank is a hole (with a plug) leading to a pipe, and the hole and the pipe should be large, to allow the tank to be emptied rapidly. A stretcher must be provided of such a size as can be placed easily within the tank. It should consist of an oak or teak frame

on which is stretched a piece of stout waterproof canvas with a few openings cut in it, so that the water can run quickly through when the patient is lifted from the tank. A head-rest of iron rod and canvas is fixed to one end of the stretcher. A stout piece of plank about a foot longer than the width of the tank is also required. The patient, covered with a single sheet, having been moved gently to one side of the bed, the stretcher is laid upon the other. It is then very easy to shift the patient on to the stretcher with very little movement. The stout piece of plank is laid across one end of the tank. The stretcher is lifted, and placed with one extremity resting on the free end of the tank, and the other on the piece of plank. The patient's face, neck, and shoulders are then sponged for a few minutes with the water in the tank, into which, after the plank has been removed, he is gently let down. On removing him from the bath, the stretcher is placed for three or four minutes on the end of the tank and on the plank, to allow the water to run off and a dry sheet to be substituted for the wet one ; meanwhile the patient's face and hair are lightly rubbed dry with a towel. He is then, without the trunk and limbs having been dried, put to bed between warm blankets—the bath-sheet being removed—with a hot water-bottle to his feet, and allowed to remain half an hour or so before the bed is properly made.

The temperature of the water used in sponging, packing, or bathing depends upon the circumstances of the case. In warm summer weather patients will enjoy a bath at a temperature of 80° F. ; yet they will object most strongly to the same bath in the winter time, even though the temperature of the ward is 60° to 65°. Cold baths are not borne well by children, old persons, and those with feeble circulation, acute or chronic. For such patients tepid or warm baths should be employed. For sponging, water at 65° to 70° should be used ; but in severe cases, colder, and even iced, water may be necessary. For cold packs the water should be 75° to 80° ; but in the continuous pack it should be 90° to 98°. In the strict Brand's bath-treatment the temperature of the water is 65° to 70°. In the writer's opinion this is unnecessarily low, and he prefers a temperature of 80° to 90°, except in cases of hyperpyrexia, when iced water may be essential for baths or packs. If water at a temperature of below 80° is used, it is advisable to give the patient a stimulant just before the bath, and to administer vigorous friction to the extremities while he is in it in order to keep up a free circulation. If a bath at a lower temperature than 65° is to be given, it is best to lower the temperature from about 70° by putting in ice while the patient is in the bath. In the *continuous bath* the patient is continually immersed for a period of several days or even weeks. The temperature of the water must be 90° to 98°. In order to carry out this form of bath in a manner agreeable to the patient and those nursing him, there must be arrangements for maintaining the water always at the same temperature, and for letting water dirtied by excreta rapidly out of the bath through a large funnel placed beneath an opening in the bed-ticking on which the patient rests. This opening is opposite the buttocks, between which and the ticking should be placed a ring-shaped air-cushion. The patient's body is wrapped in a blanket, and the tank should be covered with blankets except at the patient's head.

Cold and even tepid water, applied to the skin, acts as a cardiac stimulant. In cases where this stimulant is not required, warm baths at about 104° are decidedly beneficial. Whenever the use of water is prolonged, careful observation should be kept for collapse, which not infrequently occurs.

Cold may also be applied to the skin by means of a Leiter's coil made of aluminium, placed upon the abdomen, chest, or head. A continuous stream of water at the requisite temperature is allowed to run through the coil. Or ice may be applied to the abdomen ; it should be broken up into small fragments and laid upon a layer of lint, the ends of which are wrapped lightly round absorbent wool at the sides of the abdomen, so that the water from the melting ice may not run into the bed. An ice poultice is also an excellent method of applying ice. A layer of linseed meal is spread upon a piece of jaconet (or oiled silk or cambric), the edges of which have been folded over for about 1½ in. and fastened with safety-pins at the corners, to prevent the constituents of the poultice from escaping. Upon the meal a layer of ice, which has been broken up into small fragments, is laid. A little common salt should be mixed with the ice. Another layer of meal is placed over the ice. Each of the three layers should be about a quarter of an inch thick. Another piece of jaconet covers the outer layer of meal, and should be fastened at its edges to the inner

piece. Between the poultice and the patient's skin a piece of lint should be applied. Lastly, the air round the patient may be cooled by suspending above him, from a cradle, a tray containing ice. The ice must be frequently renewed, and there must be a drain for the water from the melting ice.

The writer is of opinion that the methods described above are more suitable for the reduction of temperature and the alleviation of other symptoms of fever than are drugs, and that of these methods, baths and wet packs are the best. But in cases where drugs must be used in preference to these measures, quinine in 3- to 10-gr. doses, phenazone up to 10 gr., and acetanilide (antifebrin) 2½ to 5 gr., may be given, being repeated at intervals of four hours when necessary; acetanilide is the safer of the last two drugs.

In cases of delirium, where the hydrotherapeutic methods just described are contra-indicated or have proved unavailing, restraint may have to be applied: padded side-boards, or a sheet passing over the patient's body, may be fastened to the sides of the bed. In such active delirium as occurs in small-pox and typhus fever, an attendant must be constantly at the bedside. Opium, chloral hydrate, potassium bromide, chloral formamide, sulphonal, and methylsulphonal are all useful drugs in cases where other measures fail.

Headache may be relieved by the application of cold compresses, a Leiter's coil, or an evaporating lotion, with a dose of potassium bromide or phenazone.

It is most important to keep the mouth moist and clean. This may be effected by frequently washing or swabbing it out with lemon-juice and water, or the following solution:—

℞	Glycerini Boracis	℥j	Aquæ	q.s. ad ℥xij
	Tincturæ Myrrhæ	℥ij		

or,

℞	Liquoris Potassii	1 part	Aquæ	80 parts, or more
	Acidi Carbolici Puri	1 part		

or the compound alkaline lotion mentioned in the article on DIPHTHERIA.

In all cases of continued fever, bed-sores are likely to form, often with rapidity. To prevent their occurrence, the patient must not be allowed to remain too long in one position, and the skin of the back and of bony prominences must be rubbed three times a day, or whenever the sheets are soiled, with equal parts of methylated spirit and water, and dusted with starch and zinc powder. A water-bed or water-pillows are also most useful.

Retention of urine is not uncommon in cases of continued fever; hence daily examination should be made of the bladder, and, if necessary, a catheter passed.

The nurses in attendance should be warned to look out for special symptoms, according to the nature of the disease. During convalescence, sunshine and fresh air are the best medicines, and in fine weather the patient should be wheeled or carried into the open air as soon as he is strong enough to bear the removal. As anæmia often results from a severe attack of an infectious disease, iron is frequently indicated.

A case of infectious disease having occurred in a family or institution and having been promptly removed, the question may be asked, When can it be said that no fresh cases will arise? The answer depends upon the nature of the disease and the thoroughness with which disinfection after the removal of the first case has been carried out. Suppose a case of measles, for example, has occurred in a school; none of the scholars who have not had the disease before can be considered safe till the longest incubation period of measles has passed, that is, three weeks. No new scholars should be admitted to the school, nor should those exposed to the first infection be sent home (in the case of a boarding-school), till three weeks have elapsed. The longest incubation period of an infectious disease may be called the 'quarantine period', and will be found mentioned in connection with each disease. The necessity for enforcing a quarantine will vary according to circumstances. In some diseases (e.g., typhoid fever), it will rarely be necessary.

(*See* ANTHRAX, CHICKEN-POX, DIPHTHERIA, ENTERIC FEVER, GLANDERS, INFLUENZA, MEASLES, MENINGITIS, MUMPS, SCARLET FEVER, SMALL-POX, TYPHUS.)

E. W. Goodall.

FIBROIDS (FIBROMYOMATA) OF THE UTERUS.—These tumours are of extraordinary frequency. It is stated that 40 per cent of all women have fibroids, and that single women of middle age are seldom without them. Most of them are insignificant and are unnoticed; they cause no symptoms and require no treatment. Fibroids which are favourably placed (i.e., subserous fibroids) sometimes grow to a great size without causing symptoms, or indeed without causing the slightest discomfort; on the other hand, small fibroids projecting into the cavity of the uterus (i.e., submucous fibroids and fibroid polypi) usually cause severe menstrual bleeding.

The chief symptoms of fibroids are menstrual bleeding and pressure symptoms, and are determined partly by the size and partly by the position of the tumour or tumours (for they are usually multiple) in the uterus. Fibroids which grow from the supravaginal cervix, or between the layers of the broad ligament, often compress and distort the urethra and cause retention of urine. Progressive menstrual bleeding, if allowed to continue, sooner or later leads to a severe secondary anæmia. Fibroids increase greatly in size during pregnancy, but involute during the puerperium. They seldom cause abortion or premature labour; if unfavourably placed they may obstruct labour, or may cause morbid adhesion of the placenta; during the puerperium they may become infected and undergo septic necrosis. Sarcomatous changes are found to occur in about one per cent of fibroids. During pregnancy a fibroid may become suddenly tender and painful, sometimes with an accompanying rise of temperature; these symptoms soon subside, and are due to a peculiar form of degeneration, known as necrobiosis or red degeneration. Other degenerative changes in fibroids are of minor importance. All the above points have a bearing on the indications for treatment.

The treatment of fibroids is surgical. The indications for operation are the size of the tumour and the occurrence of symptoms. Even if a large fibroid is accompanied by no symptoms it should be removed, as it is sure to cause trouble sooner or later. A fibroid that reaches half-way up to the umbilicus may be called large. The symptoms that call for surgical treatment are (1) bleeding, (2) pain and pressure symptoms, (3) evidence of rapid growth. The operative treatment for fibroids is either enucleation of the tumour (myomectomy) or removal of the uterus (hysterectomy). A fibroid polypus or an accessible submucous fibroid is removed by vaginal myomectomy, usually after dilatation of the cervix or after splitting the cervix after reflecting the bladder (anterior vaginal hysterotomy). Favourably placed fibroids may be removed by abdominal myomectomy; when this can be done it must be looked upon as a piece of good fortune, for the sacrifice of the uterus as a child-bearing organ is avoided. In most cases operative treatment must consist in removing the uterus with the fibroids by abdominal hysterectomy, which may be partial or complete. In partial or supravaginal hysterectomy the body of the uterus with the fibroids is removed, but the cervix is left. In complete or total hysterectomy the body and cervix are both removed. Partial hysterectomy is generally held to be the better operation, for it is quicker and easier to perform, and the chances of cancer developing in the remnant of the cervix are too remote to outweigh these advantages. One or both ovaries should be left. The mortality of supravaginal hysterectomy for fibroids should not, in skilful hands, exceed one per cent.

The operation of curetting is sometimes performed for the relief of bleeding; it acts by removing the thickened endometrium from the enlarged uterine cavity. The relief it brings is usually only temporary, and the day of the major operation is merely postponed. It should be used only in small fibroids and with the object of tiding the patient over the menopause, in the hope of future atrophy of the tumour.

Drugs, the chief of which is ergot, have in the past been commonly used to treat the bleeding of fibroids; their action is uncertain and unsatisfactory, and they do not nowadays compete with surgical treatment, the results of which are so sure and safe.

Much more will be heard in the near future of the treatment of fibroids by *x* rays and radium. The radiation acts by destroying the follicles of the ovaries and thus bringing about an artificial menopause, the results of which are often disagreeable. The treatment is thus most suitable for patients near the menopause, but opinions as to its results are conflicting, and it has not yet met with general acceptance. *Eardley Holland.*

FIBROSITIS.—(*See* Rheumatism, Chronic.)

FILARIASIS.—The only important series of diseases in this class are those due to lymphatic obstruction caused by *Filaria bancrofti*. In the case of patients in tropical countries who harbour the parasite, whether there be any symptoms or not, it is of the utmost importance, by the careful use of mosquito nets, to prevent the possibility of the patient's re-infecting himself by the mosquitoes which have fed on him ten or more days previously. No drugs have any effect on the worm, once it is introduced into the body. For the effects of lymphatic obstruction, elephantiasis, etc., something can be done by careful bandaging and massage. As a rule, surgical operations are necessary if the removal of the deformity be desired. In the course of prolonged treatment of trypanosomiasis with atoxyl, soamin, etc., filarial embryos have been observed to disappear from the blood, but the attempts to treat filariasis by these drugs have failed, and after an interval the embryos will be found in the blood again.

Every care as regards cleanliness, and avoidance of injury and exposure, should be taken, as the vitality of elephantoid masses is low, and lymphangitis, ulceration, and suppuration readily occur. Cooling lotions, such as lotio plumbi cum opio, and perfect rest, usually readily relieve the spurious erysipelatoid attacks that are so common in the disease.

In chyluria and hæmatochyluria, improvement rapidly results from rest, free purgation, and bland diuretics, such as boracic acid solution or alkaline carbonates, citrates, etc. *C. W. Daniels.*

FINGER CRACKS.—The hard edges of deep cracks should first be smoothed away with pumice-stone or a nail file. The following ointment should then be applied at night, and gloves or a finger-stall worn: White beeswax, 300 parts; gum arabic, 350 parts; water, 300 parts; boil, and add 50 parts of glycerin and 100 of water. The ointment must be quite stiff, and for this purpose a little lanolin may be added, and the water reduced.

Shoemaker's wax may also be heated and used to fill the crack, but it looks rather dirty. Another plan is to fix a thin wisp of cotton-wool over the crack (with a good grip of the adjacent nail) by means of collodion (Duncan & Flockhart's 'epicolloid' is very suitable for the purpose). The application is renewed every two or three days. *Robert Hutchison.*

FINGER, TRIGGER.—(*See* Trigger Finger.)

FISTULA IN ANO.—(*See* Abscess, Ischiorectal; Anus, Surgical Diseases of.)

FISTULA, BILIARY.—(*See* Biliary Fistula.)

FLAT-FOOT, WEAK FOOT, EVERTED FOOT.—Of these three terms the last is most accurately descriptive of this deformity, which essentially consists in eversion and abduction of the front part of the foot at the mid-tarsal joint.

The condition is produced by a disproportion between the weight to be carried and the strength of the muscles and ligaments which maintain the arch of the foot, together with erroneous deflection of the body weight too much to the inner side of the foot. Pointed boots cause abduction of the great toe and narrowing of the anterior part of the base of support of the foot; tight boots cramp the foot, and lead to disuse-atrophy of its small muscles. Rapid increase in weight, unaccustomed weight-carrying, prolonged standing, or an illness such as influenza, which depresses the muscular tone of the body, may precipitate yielding of the arch. Knock-knee causes the body weight to fall too much on the inner side of the foot, and throws an undue strain on the structures which maintain the inner half of the arch. In some cases contraction of the calf muscles is an antecedent of flat-foot. Lengthening of the tendo Achillis is a necessary preliminary to treatment of the flat-foot proper. Finally, an accident, such as a sprained ankle, may be followed by flat-foot, if care be not taken to protect the injured foot from improper deviation of the body weight.

No treatment is fundamentally sound which does not aim at restoring the strength of weak muscles and ligaments on the inner side of the foot, first by relieving them of undue strain, and secondly by well-arranged exercise. The former is attained by making

the patient wear properly-shaped boots, straight on the inside, so that the great toe and fore part of the foot are not abducted, and with the inner side of the heel a quarter of an inch higher than the outer, so as to throw the body weight off the inner part of the arch on to the outer side of the foot. This alteration in the heel also makes the patient walk with his feet parallel instead of turned out. The sole of the boot must be flat and stiff, and the heel broad, or this device will not act properly.

The tibial muscles and the instep should be massaged to improve the nutrition of the weakened structures. The patient should first practise flexion and extension of the toes, and circumduction movements of the foot, in order to strengthen its small muscles; then he should proceed to tip-toe exercises, and should practise walking on the outside edge of his foot, and never with the toes out-turned.

Clinically, three types of flat-foot may be recognized:—

1. *Painful or weak foot*, which is too often diagnosed as rheumatism. This is the early stage, in which the ligaments are becoming stretched and strained. The surgeon confirms his diagnosis by eliciting pain by pressing on the spring ligament under the tubercle of the scaphoid, and also by everting the fore part of the foot. At this stage the treatment described above suffices.

2. *Painless flat-foot.* In this stage the arch has already descended, but the ligaments and bones have adjusted themselves to the new conditions. The foot is stiff and devoid of spring, the gait heavy and clumsy.

If treatment be demanded, an anæsthetic should be administered and the foot wrenched with a Thomas's wrench till it is perfectly supple. It is then fully inverted, and put up in plaster-of-Paris for two or three days. After this a thorough course of massage and exercise will greatly improve, or even completely restore, the arch and spring of the foot, provided the patient wears the boots altered as described above; if he does not, a relapse is certain.

3. *Painful flat-foot* is an acute condition in which the ligaments have stretched and the arch has sunk rapidly; the whole foot is acutely tender. Such a case must first rest in bed for a few days, with light massage, till the acute tenderness has passed off. The foot is then inverted and put up in plaster, after which the treatment is that described for the previous condition.

Though the use of plates or arches inside the boot to support the arch of the foot is fundamentally wrong—for the muscles in the hollow of the foot are thus compressed between the plate below and the bones of the tarsus above, and cannot recover their normal function—the use of sole-plates in adults is justifiable. Rarely will an adult spend sufficient time and trouble to effect a cure, while tilting up the inner side of the boot often causes or aggravates a corn on the little toe, and, moreover, in adults there is commonly a flattening of the transverse arch of the foot, a painful condition best relieved by a specially moulded sole-plate as practised by Trethowan. These sole-plates give the patients relief, which is what they want. The plates must be made specially for each individual case, not bought ready-made, a necessary preliminary being the making of a plaster cast of the foot. This is then carved up and the extent of the plate marked out on it, so that the foot will be supported where necessary and nowhere else.

The treatment in each variety, therefore, when symmetry has been restored, is directed to deviate body weight from the inside to the outside of the tarsus, and to strengthen the tibial and plantar groups of muscles by exercise. *Robert Jones.*

(Revised by H. A. T. Fairbank.)

FLATULENCE.

1. **Gastric.**—In gastric flatulence the diet should consist of small dry meals in which animal foods predominate. All 'sloppy' articles should be avoided (e.g., soups, porridge, etc.), and all raw fruits and green vegetables except spinach, asparagus, and the white part of cauliflower. Dry toast, rusks, or breakfast biscuits should be substituted for bread, and the best sweets are custards, jellies, junket, and stewed fruit. The patient should as far as possible drink only between meals, and tea is best avoided altogether. If he is unable to take his meals quite dry a claret-glassful of hot water may be allowed at lunch and dinner, and a teacupful of coffee and milk at breakfast. A glass of wine or a little spirit and water at meals is sometimes helpful, especially in old persons.

The most useful drugs are alkalis combined with carminatives (cajuput, cardamoms,

spiritus ammoniæ co., spiritus ætheris, etc.) and nux vomica. Creasote, carbolic acid, and ichthyol are also of value, or benzonaphthol (10 gr. in powder t.d.s.), or a combination of bismuth (5 gr.) and charcoal (8 gr.). Carminative tablets and capsules are made by most manufacturing chemists, and are convenient to carry about. For extreme flatulence which the patient has difficulty in bringing up, a little neat brandy is the best remedy, or a teaspoonful of a mixture of equal parts of spiritus cajuput, spiritus ammoniæ co., and spiritus chloroformi. The following is also a powerful carminative :—

℞ Mentholis gr. ss | Tincturæ Lavandulæ Co. āā
Spiritus Ammoniæ Co.

One teaspoonful in a wineglassful of water as required.

For offensive eructations occurring as a result of organic dilatation of the stomach, lavage is the best treatment (*see* STOMACH, DILATATION OF).

2. **Intestinal.**—The indications for treatment in intestinal flatulence are to prevent fermentation and to ensure a daily action of the bowels. With the former object cellulose should as far as possible be eliminated from the diet. Fruit and vegetables, wholemeal bread, and jams should therefore be forbidden, and potatoes only allowed in small quantity. Eggs are best avoided because of their tendency to form sulphuretted hydrogen. Intestinal antiseptics are apt to be disappointing in their results, but the best are benzonaphthol (5 gr. in cachet), naphtholated charcoal (1 drachm night and morning), salol, bismuth salicylate, dimol, and cyllin or kerol in capsules. In order to keep the bowels open a regular laxative should be employed, the best being paraffin, liquid cascara, senna pods, or aloes. Salines should be avoided. The pil. galbani co. of the B.P. is useful as a carminative, and if there be colicky pain the following pill may be tried :—

℞ Mentholis | Extracti Belladonnæ āā gr. $\frac{1}{4}$

One pill three times daily.

Abdominal massage is often useful, especially if combined with abdominal exercises.

For that form of extreme intestinal flatulence known as *meteorism* the best treatment is a large turpentine enema and the application of turpentine stupes. Castor oil may be given by the mouth if there is no obstruction. Physostigmine ($\frac{1}{100}$ gr. hypodermically every four hours for 6 doses) or an injection of pituitrin ($\frac{1}{2}$ to 1 c.c. of 20 per cent extract intramuscularly) are useful in post-operative cases. Atropine ($\frac{1}{60}$ gr. once or twice daily) is also of service. (*See also* COLIC.)

3. **Nervous** (Eructatio Nervosa, Air-swallowing).—This form of flatulence is not uncommon in young men, and in women about the menopause. It can be recognized by its violence, and by the fact that the patient can eructate 'to order'. Treatment must be directed to the nervous system. The nature of the disorder should be explained to the patient, and he should be instructed not to go on trying to bring up wind, but when an attack comes on to keep the mouth open by placing a cork between the back teeth. The diet should be the same as for gastric flatulence, and bromides and carminatives should be administered. (*See* MENOPAUSE.) *Robert Hutchison.*

FOREIGN BODIES IN THE AIR-PASSAGES OR ŒSOPHAGUS.—The history of pain after swallowing a foreign body frequently connotes a mere abrasion of the mucous membrane. This fact is so well known and generally recognized that it may become a source of danger to the patient, obscuring, as it often has done, a genuine diagnosis of the condition ; for the detection of such a wound does not of necessity negative the presence of an impacted foreign body in some other situation. If the severity and the situation of the wound fully explain the symptoms complained of, the lesion may be treated by the frequent application of hydrogen peroxide (half a teaspoonful at 3-vol. strength may be sipped at hourly intervals), while frequently one or two topical applications of solution of nitrate of silver (1 drachm to 1 oz.) will dispel the symptoms and clinch the diagnosis. Strong silver solutions are very irritating to the larynx, and the small swab employed for their application should be shaken dry, lest a drop should fall into that organ.

Experience shows that the ability of the patient to localize the position of a wound or foreign body in the throat is very imperfect, and affords no safe guide. In lesions of

the tonsil the patient frequently refers his symptoms to the level of the larynx. The case is well known of an experienced laryngologist who for many days affirmed that a foreign body was lodged in his own pyriform fossa: it was ultimately found, however, in his post-nasal space. The power of localization at the base of the tongue and in the valeculæ is fairly accurate. The examination of the valeculæ with the mirror is often difficult without special appliances, and a sweep of the finger first on one side and then on the other of the frænum of the epiglottis will, as a rule, do all that is required both for diagnosis and treatment in this region.

The tonsil is the most frequent seat of impaction of a small, sharp, foreign body such as a pin or fish-bone. Here palpation is often delusive, and a careful examination under powerful illumination is necessary. Unless the patient is docile and the illumination adequate, mistakes may easily be made, and it is advisable to apply a local anæsthetic before manipulating with probes and forceps. This is best done by inserting a swab of cotton-wool half the size of a pea, carried on the end of a probe and soaked with 20 per cent cocaine, into the fossa at the upper end of the tonsil (the 'supratonsillar fossa' of older text-books), and leaving it *in situ* for five minutes, the patient holding the probe between his molar teeth. A small semi-transparent fish-bone is not easily detected; moreover, the minute bead of exudation often seen at the mouth of a crypt can be mistaken for the butt-end of a fish-bone, particularly if it be surrounded by a red areola.

It is of the utmost importance that the foreign body, when detected, should be seized with certainty and precision at the outset; hasty attempts at removal under imperfect illumination often result in driving the object deeply into the tissues, with the possible sequel of an elaborate search made under the much more difficult conditions which accompany general anæsthesia.

Any approach to roughness in dealing with these cases can readily lead to laceration, sepsis, and fatal mediastinitis. Furthermore, the experience of the most skilful surgeons shows that it is easy to be mistaken in these cases, and foreign bodies have been ejected or found post mortem when their presence has been denied after careful search. It is therefore important that surgeons who do not profess special skill in throat work should be extremely cautious in expressing the definite opinion that a foreign body is absent.

The general statement may be made that the presence of a foreign body in the air-passages or the upper digestive tract may always become the source of genuine danger, and that the examination must always be made with extreme care, and the treatment conducted with perfect precision. If the matter is approached in this spirit, there is no reason to-day, thanks to modern developments of technique, why any practitioner should not find himself competent to deal with such cases, granted the presence of certain instruments, a set of which should be kept at every cottage hospital.

With regard to the nature of the foreign bodies hitherto recorded, and their seats of impaction, tables may be consulted*; but as the unexpected must be looked for, the surgeon will in practice rely—(1) Upon the history given by the patient or friends; (2) Upon ocular or digital examination; (3) Upon radioscopic findings.

In the case of large bodies impacted in the pharynx, or of inflammatory swelling of that part resulting from injury, the functions of respiration and of deglutition will both be affected. The diagnosis may generally be established by the history, by direct inspection with tongue deeply depressed, and by the finger. With regard to palpation, two points must be remembered: (1) That a foreign body may be dislodged thereby, and shifted well into the larynx; (2) That dyspnœa may be increased by the addition of spastic closure of the glottis. The surgeon, therefore, should in all cases be prepared to open the windpipe.

In an emergency, the safest, quickest, and easiest route into the windpipe is through the cricothyroid membrane. Even in infants and stout adults the hard upper edge of the cricoid cartilage can be detected by palpation. It is felt as a well-defined, horizontal rim, quite unlike the notch above the pomum Adami. The upper edge of the

---

* StClair Thomson, *Diseases of the Throat and Nose*, 1912; Howarth's translation of Brünings' *Direct Laryngoscopy*, etc., 1912.

cricoid being defined with the index nail of the left hand, a narrow knife-blade (and preferably a blunt one), held 'short' and horizontally between the thumb and index of the right hand, is thrust through skin and cricothyroid membrane into the subglottic space, and the wound is immediately dilated either with dressing-forceps or improvised retractors: better still, fitted with an improvised tube large enough to be gripped so tightly in the cricothyroid wound as to form a watertight joint. If the knife is made to graze the upper edge of the cricoid, the small cricothyroid artery will not be wounded; while if the knife is blunt, the veins are likely to escape puncture; but should hæmorrhage occur, the patient must be turned semi-prone, and blood be wiped away at each exhalation until hæmostasis, generally spontaneous after respiration is restored, is obtained. When time permits, it is possible to avoid the danger of wounding the veins by incising the skin first, and preferably by transfixion of a fold drawn forward by the operator and an assistant. Danger of the inhalation of blood is obviated by the flattened cricothyrotomy tube of Bond, which fits tightly into the wound. Cricothyrotomy is a temporary measure, for the tube in this situation can seldom be tolerated for more than a day.

The operations of tracheotomy need not be detailed in these paragraphs (*see* Laryngeal Obstruction), but a bloodless and rapid method may be mentioned. After the skin incision, the knife is definitely laid aside till required to open the trachea. Two blunt double-hook retractors are held one in each hand, and the prongs pressed into the tissues immediately below the level of the lower edge of the cricoid cartilage, not exactly in the middle line, but transgressing it by a sixth of an inch, the two instruments overlapping. If forcible retraction is now made, no remnant of tissue can remain in the middle line to obscure the view, while the absence of cutting edges ensures a perfectly dry wound resembling that of a post-mortem operation. Three or four retractions made in this way, and at varying levels, will expose either the pretracheal fascia or the isthmus of the thyroid gland. If the isthmus needs to be severed, a horizontal snick is made with scissors immediately below the cricoid through the pretracheal fascia which attaches the isthmus to that cartilage. Through this snick two hæmostatic forceps are inserted close to the middle line, and their jaws thrust down towards the sternum and then closed, to clamp the entire width of the isthmus. If now the handles are forcibly separated so as to lie across the neck, the isthmus is thereby torn through in the middle line, and each half is ligated at leisure. The object of this manœuvre is to avoid hæmorrhage from the veins about the isthmus, and particularly from the plexus below it. The jaws of the forceps, therefore, must not trangress the lower edge of the isthmus—a matter determined by palpation, unless, of course, the details of the venous plexus are visible. It must be admitted that the chief cause of delay and difficulty in tracheotomy is hæmorrhage from these veins, resulting from the use of the knife where no knife is needed—for the operation as described above can be performed in two minutes even on an infant a few days old.

Though all cases of foreign bodies in the air-passages are in a sense urgent, they may be divided for practical purposes into two classes: (1) *Emergency cases;* and (2) *Deliberate cases.*

1. **Emergency Cases.**—These are most commonly met with in the operating theatre, and particularly when the pharyngeal and laryngeal reflexes have been abolished by deep chloroform anæsthesia. The surgeon should take many opportunities of habituating his finger to the feel of the normal larynx, for the uninitiated may at a critical moment find himself in doubt as to whether he is touching a normal arytenoid or a fragment of impacted tonsil or turbinate; his doubts may be increased if after seizing a suspected foreign substance he finds it to be, as is sometimes the case, firmly held by the vestibule of the larynx, which can act as a prehensile organ of some power. A piece of sponge coated with blood-clot, or a piece of vomited food, sometimes proves an object difficult to detect with certainty, and forcible traction must not be made upon it until its identity has been arrived at by exclusion of the epiglottis and arytenoids. It should be remembered that during spastic closure of the vestibule the arytenoids are tilted well forward: thus the finger comes down upon their posterior surface. It is better to perform cricothyrotomy than to tear out an arytenoid. Tactile skill with the finger has the additional advantage of enabling the operator to pass a blunt, flat instrument, such as the handle of a probe, through the posterior half of the glottis, and, by rotating the instrument through

90°, hold the vocal cords apart. It is an obvious fact, and therefore one well to remember at non-critical moments, that artificial respiration is worse than useless when the airway is blocked.

Foreign bodies are commonly inhaled as a result of talking and laughing when the mouth is full of food, or during the involuntary inhalation which precedes a sneeze or punctuates emotions such as surprise, anger, or fear. In this way needles or tintacks, coins and toys, bones and toothplates, sweets and beans, nuts and grassheads, as well as legitimate food and drink, are suddenly drawn into the larynx. As a rule the first contact with that organ causes sudden closure of the glottis and quick expulsion, followed by temporary spasm and aphonia; but in the unfortunate exceptions, either the vestibule in its contraction, or the cords themselves, grip the object tightly and even bury a sharp point firmly in the tissues, and the condition becomes one of urgency if the foreign body is large enough to cause genuine obstruction: for it would seem that the spasm induced by the presence of a small body does not end fatally, at all events in the adult.

The dyspnœa resulting from mere spasm may be treated in the following manner, as described by Semon. The patient must, by a mental effort, resist the natural impulse to make a deep inhalation; on the contrary, he must hold his breath while he counts ten, and then with the mouth closed he should make very shallow, rapid respirations through the nose. It is said that when the necessary presence of mind exists, this process will invariably and quickly relieve the dyspnœa, granted of course that no foreign body remains in the larynx.

When obstruction is complete, the case can only be saved on amateur first-aid lines—namely, by partial inversion of the person, with violent slapping of the back, by inversion and jolting in a child, and by using the finger or by immediate opening of the windpipe.

In emergency cases brought to the doctor, some space for respiration remains. His chief guide will be the history, aided by inspection with tongue-depressor or mirror (and if possible he should allay spasm by spraying with 5 per cent cocaine before attempting examination); but in any case his first thought should be to be prepared for cricothyrotomy. No palpation should be attempted until a pocket-knife is open and ready; for displacement of the object may cause immediate and complete obstruction. When palpation reveals the presence of a dangerous body, such as a tooth-plate or bone, firmly held in the vestibule, the case should be converted from the emergency to the deliberate class by the performance of cricothyrotomy; for the hasty, forcible, and blind removal of such a body may not only cause permanent damage, but will almost certainly require to be followed by tracheotomy.

In no case should distressing dyspnœa be allowed to persist for any length of time, and the absence of cyanosis cannot be taken as a criterion of the safety of the patient; slow asphyxiation, with ultimate sudden collapse, may be accompanied by pallor without cyanosis. In all cases of doubt, the airway should be opened or the doctor remain in attendance.

There exists a second division of emergency cases, where attacks of intense dyspnœa alternate with periods of comparative, and indeed sometimes of complete, ease. Such a condition may be brought about by the displacement from time to time of an object not firmly fixed in the larynx, but held sufficiently tightly to withstand the expulsive efforts of coughing. These alternating attacks of dyspnœa and comparative ease are, however, typical of the presence of a body lying loose in the trachea, and thrown by the act of coughing from time to time into the subglottic space—which, needless to say, is much smaller in diameter than the trachea. Such a case must not be left by the surgeon for a moment until permanent relief is obtained. A surgeon thoroughly used to the manipulation of the bronchoscope and forceps would keep the patient perfectly at rest in one position until the arrival of instruments for removal by the peroral method; but in any case he would make all preparations for tracheotomy, and under many circumstances would freely expose the trachea before commencing peroral manipulations. In these cases tracheotomy and not cricothyrotomy is indicated, and the windpipe should be opened widely, and as low as possible. As a rule a loose body is expelled as soon as the trachea is opened; but it must always be remembered that however low the tracheotomy opening may be, the foreign body can and may remain below it, and may need removal

with forceps. Possession of the bronchoscopic instruments should, as a rule, render this a simple matter ; but where these are lacking, the forehead mirror and reflected light should be used. Although it will be obvious to the surgeon as soon as he has opened the trachea, it may be well here to emphasize the fact, so that he may complete his preparations, that tracheotomy *per se* does not relieve the patient from imminent danger. A change in the position of the foreign body may at any moment obstruct the tracheotomy tube and even the entire tracheal lumen, apart from the fact that it may enter a bronchus. The body, therefore, must at once be removed, and to this end advantage should be taken both of the plasticity of the trachea and of its comparative freedom in the freshly-made wound, conditions which may even allow a direct view of the bifurcation to be obtained. The patient should lie supine on the table, with his head over the end of it supported by hand, and the chin turned as far as possible to the left. The surgeon will look down the trachea over the patient's right shoulder, the hole in the forehead mirror being opposite the operator's right eye, and the source of illumination held to his right front. The light should be so placed as not to shine into and dazzle the left eye. So far as may be possible, the tracheal axis is now drawn into the operator's line of vision by means of a flat instrument such as the handle of a retractor held in the left hand or by an assistant, the mucous membrane having been desensitized by cocaine. The view will be facilitated by stitching the trachea to the skin ; such stitching must be 'through and through' the tracheal wall, and must include a cartilage ring. With a trachea half filled with a foam of blood-stained mucus, an effective view may be difficult enough to obtain, and great patience may be necessary. Small pieces of loose-textured marine sponge held in forceps will be found serviceable for the removal of mucus, while cough may be allayed by painting the carina or ridge at the bifurcation, with 20 per cent cocaine. In any case a proper view must be obtained, and distances well realized, before any attempt is made to extract with the forceps, otherwise the surgeon runs a risk of seizing and lacerating the carina. After a satisfactory but fruitless search below, the upper portion of the trachea should be examined, and also the pharynx, nasopharynx, nose, mouth—and even the table ; for after tracheotomy the foreign body may be expelled through the glottis and escape unobserved. If necessary, the chest should now be examined for evidence of deficient air-entry, indicating obstruction of one or other bronchus. Foreign bodies enter the right bronchus more readily than the left, owing to the more acute angle at which the former leaves the tracheal axis (*see* p. 333) and to its greater size, which is nearly equal to that of the trachea : to obtain a view of it the surgeon will look over the patient's left shoulder, with the chin of the latter turned to the right.

With complete obstruction of one bronchus, and consequent absence of any expulsive power behind the foreign body, the case passes into the second category, and will be dealt with under the head of 'deliberate' cases.

2. **Deliberate Cases.**—The word deliberate is used merely to imply that the condition of the patient permits of an hour or so in which to make adequate preparations and to plan a course of action after complete diagnosis.

Many cases are on record where foreign bodies have been retained for months and even years without serious ill-health ; but in general it should be considered that all cases are urgent, seeing that at any time dislodgement, ulceration, inflammatory swelling, and particularly septic bronchitis and pneumonia or pulmonary abscess, may supervene.

A foreign body in the larynx may be suspected from the history, subjective symptoms, alterations in the voice, and stridor. Cough may be absent, and dysphagia may be present. Diagnosis may in general be completed by laryngoscopic inspection, and in young children a view of the larynx in the mirror is often best obtained by drawing the base of the tongue forward with the hooked end of the left index finger. If this fails, one or other of the direct methods may be employed ; these will be described later. Where radiography can be brought into play, both a lateral and an anteroposterior view should be taken, or the stereoscopic method employed. By these means the size, shape, and disposition of an object opaque to the rays is determined—and, in parenthesis, it may be taken as a rough rule that when an anteroposterior view shows a flat object, such as a coin, fixed in the sagittal plane, it will prove to be in the larynx ; in the transverse plane, in the pharynx.

This is not the place to discuss details of radioscopy concerning the relative opacity

of various materials, for advances in the technique of that branch of the art are being made daily; but anatomical considerations are important, and will be considered in the section dealing with endoscopic methods.

A foreign body in the larynx detected by means of the laryngoscopic mirror may of course be removed with laryngeal forceps if the requisite skill is available to make use of them under visual control. This article, however, is intended for those untrained in laryngology, and consideration will now be given to the direct methods, which have revolutionized the surgery of foreign bodies in the throat.

ENDOSCOPY OF THE AIR-PASSAGES AND ŒSOPHAGUS.

More than a dozen years ago laryngologists adopted, as one of their routine and everyday methods of examination and treatment, the employment of straight spatulæ and tubes introduced into the air and food-passages. As a consequence, the surgery of many diseases, and particularly the treatment of 'foreign body' cases, has been revolutionized; and it is a source of surprise to some of us that this fact is not more generally recognized, and indeed that these methods have not become part of the ordinary manœuvres of medical practice. At one time the cost of instruments was high, but to-day a very efficient and compact set, meeting general requirements, can be purchased for a few guineas (e.g., Brünings' set, *vide* the surgical instrument catalogues, price about twenty pounds, exclusive of an electric accumulator).

It goes without saying that extremely baffling cases will occur in this as in every other branch of surgery; but the difficulties and dangers to be expected are comparable with those which accompany the use of urethral and uterine instruments, and may be met by conscientious care, delicacy of touch, and patience. There is nothing occult about these manœuvres, and they are, in a sense, less 'technical' than those of ordinary laryngology and ophthalmology. At the least, every cottage hospital should be equipped with a set of instruments, and one member of the staff could, after a short course of attendance at any hospital throat department, learn enough to be of practical value; for the chief requirements of the endoscopist are good or well-corrected eyesight, cautious judgement, and the careful and gentle handling which all delicate surgery demands. In a word, the pioneer work in this department has been accomplished, and the regions of surgery opened up are ready for general occupation.

If asked for advice by a doctor responsible for the surgery, say, of an isolated township in the Colonies, I would make the following suggestions: (1) The purchase of Brünings' set, with the addition of two spare bulbs for the suction apparatus, six spare electric bulbs, a pair of Paterson's laryngeal forceps, and a ten-volt accumulator with a rheostat. If funds are forthcoming for a more complete armamentarium, Brünings' *Direct Laryngoscopy, etc.* (English translation by Howarth) may be consulted: but no armamentarium can be absolutely complete. (2) A little practice in using the forceps through the bronchoscope to pick up small objects, in order to accustom the eye to judging distance by monocular vision. (3) Practice upon the cadaver. This is in some respects more difficult than practice *in vivo*, but it will give some idea of the small degree of force required to overcome friction.

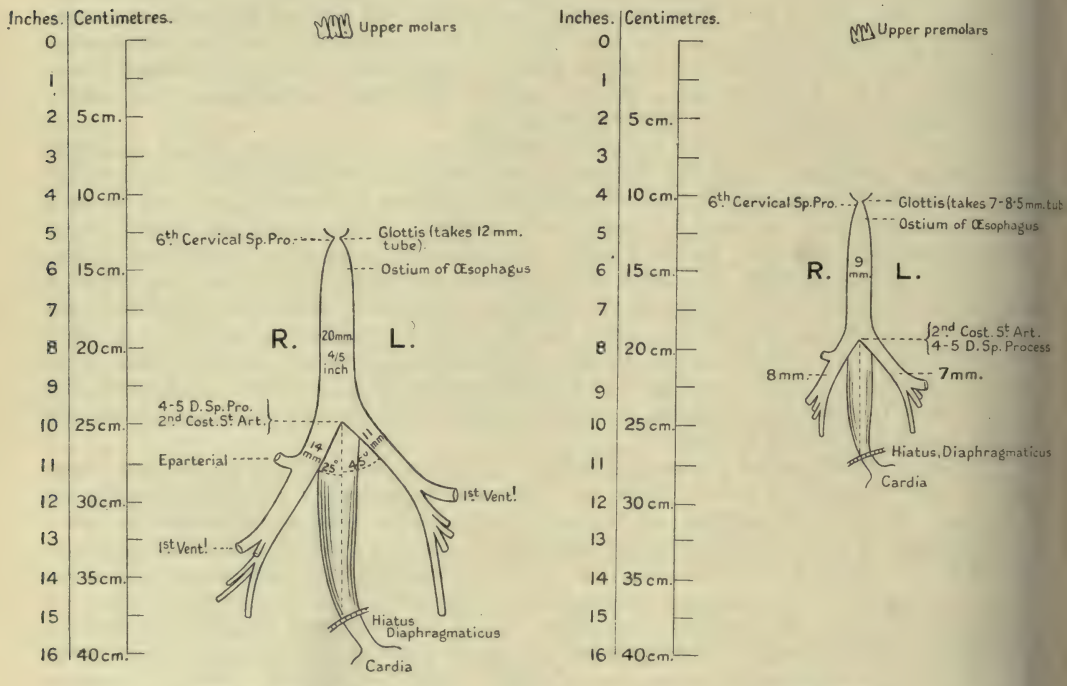
Care must be taken not to dent the tubes, which are made of soft metal, otherwise the inner or extension tubes will cease to run smoothly in the outer tube or spatula. Forceps and probes must not be bent in cleaning, or their shafts will obstruct the view when used in the tubes. The light must be focused at the appropriate distance by rotating the cap which carries the condensing lens, and it should also be centred correctly by fixing a tube to the handle and adjusting the mirror. It is for this adjustment that the two small fibre-covered handles are intended. It will be noted that a slide enables the upper and lower portions of the handle to be separated by nearly three inches, in order to facilitate the use of forceps, etc., and that the upper portion can be turned to one side to enable the extension tubes to be inserted into the tube spatulæ. The spring-like handle of the extension tube will bend and kink unless held 'short' during its propulsion down the spatula. In adjusting the forceps at the length appropriate to the case before commencing operations, the jaws must be tested to see that they come firmly together.

Anatomical Details.

Some knowledge of anatomical detail other than that obtained in the dissecting-room is necessary, if the results of radiography are to be of value and the endoscopic manœuvres conducted with ease; what follows will serve as a useful general guide, and it is simply expressed by the accompanying diagram (*Fig.* 30), in which the measurements stand for those of the average adult male, and of a child of about six, respectively.

Certain points may especially be noted:—

1. The trachea is a much shorter organ than one is apt to imagine. From 4 to 4½ inches in the adult male, and 3½ to 4 inches in the female, are average measurements, and as a general rule the bifurcation lies at the level of the sternal articulation of the second rib. A fairly accurate gauge of the limits of any individual trachea may be formed by marking the positions of the 6th cervical spinous process and the interspace between the 4th and 5th dorsal.



Average Adult Male. Child of Six.

Fig. 30.—Anatomical details of air-passages and œsophagus.

2. The right bronchus leaves the tracheal axis at a small angle (e.g., 25°), and for its first inch it is sometimes nearly as large as the trachea. Moreover the carina or crest between the two bronchi is placed a little to the left of the centre of the trachea, and consequently the right bronchus may, at a hurried glance, appear almost a direct continuation of the trachea. For these reasons foreign bodies are apt to enter the right bronchus rather than the left. The ancient saying may be remembered that a shilling will enter the right but not the left bronchus. The shilling would not, however, pass down more than an inch, at which distance the eparterial bronchus is given off at a right angle. Below this point comes a narrower portion about two inches in length, at which distance division again takes place.

The left bronchus leaves the tracheal axis at a much greater angle (45° to 60°), thanks to the displacement of the left lung by the heart and to the necessity for the bronchus to sweep outwards under the arch of the aorta. As a consequence, the first

view obtained of it through the tube is that of the floor of the bronchus, but as the instrument is gently pushed down it, the bronchus straightens out. For two inches it remains undivided, and then a large ventral branch is given off. In all, about eight branches are given off by each main bronchus. The position of the aorta, first in front, then to the left side, of the trachea, and finally arching to the back of the left bronchus, will be recalled.

3. As to calibre: a full-sized trachea may be nearly an inch in diameter (23 mm.), and the first inch of the right bronchus may be little short of it. (An adult male with measurements twenty-five per cent less than these figures would, however, be no abnormality.) Very large tubes, therefore, may be inserted through a tracheotomy wound ('inferior bronchoscopy'); but in the peroral method the size of the tube is limited by the available width of the glottis, and this in an adult male may not be more than half an inch.

As the instruments are marked on the metric system, and the reader thinks in inches, and is unwilling to do division sums during an operation (i.e., centimetres $\times \frac{2}{5}$ = inches; and millimetres $\times \frac{2}{50}$ = inches), one may remark that a 25 cm. tube is 10 inches long, and will just reach the bifurcation; and that a tube 12 mm. in diameter is about as large as will pass the glottis in a male adult. Brünings gives the available width of the glottis as follows: Man, 12 to 15 mm.; woman, 10 to 13 mm.; child, 8 to 10 mm.; infant, 5 to 6·5 mm. He has adapted his tubes accordingly. Needless to say, the larger the tube the better the view; for though the illumination is more than sufficiently brilliant with the smallest tubes, the limited area seen adds to the difficulty of recognizing the parts in view at any one time.

4. It is unnecessary to burden the memory with figures relating to various ages—it is better in each case to consider that the trachea bifurcates about the fourth or fifth spinous process, or behind the second sternocostal articulation; and in order to avoid distortion of the skiagraphic picture, and to facilitate its interpretation, the direction of the rays should be horizontal, and the points mentioned should be marked on the skin by the application of opaque objects.

5. The œsophagus commences above at the lower border of the cricoid cartilage, at which level a thick band of the fibres of the inferior constrictor pharyngis forms a definite ridge projecting from the posterior wall of the gullet. Thus a well-defined ostium or mouth of the œsophagus is formed, and it is often spoken of as the cricoid constriction. Thanks to the contiguity of the cricoid cartilage, the ostium at rest takes the form of a transverse slit; but with a little distention (e.g., during the swallowing of a large bolus of food) it readily expands to an oval orifice nearly 1 inch in lateral, and $\frac{3}{5}$ inch in antero-posterior, diameter. These figures are important to remember in view of the possible passage of large foreign bodies, but they have little reference to the choice of tubes. Though the ostium may be 17 mm. in anteroposterior diameter, it is seldom possible to pass a cylindrical tube larger than 14 mm., by reason of the pressure involved against the upper teeth. The 10 mm. tube will pass in a small child.

The hiatus diaphragmaticus is also a slit-like orifice, with its long diameter sloping obliquely from in front backwards and to the left. This orifice is also very distensible, and has been dilated to a diameter of over 2 inches. The short diaphragmatic and abdominal sections of the œsophagus are directed to the left and forwards to enter the stomach; but the angle varies greatly with the degree of distention of the stomach, and also with the position of the patient, for the lumen is in a large measure straightened out when the patient is either sitting or in the right lateral recumbent position.

The walls of the main portion of the œsophagus are so distensible that for purposes of practice the size of the lumen need scarcely be considered. The organ as it descends through the thorax tends to sweep slightly to the left and forwards away from the spine, and in front of the aorta to make its passage through the diaphragm. This, however, is not always the case; the viscus may be practically straight, and a view may occasionally be obtained of the hiatus soon after the œsophagoscope has passed through the ostium.

6. At his first essay in œsophagoscopy the surgeon may be surprised to find that the thoracic œsophagus is, when normal and at rest, a cylindrical, hollow viscus containing air. This is not surprising when the phenomenon of aspiration of the thorax is considered. When the end of the œsophagoscope has passed about $1\frac{1}{2}$ to 2 inches beyond the ostium, a

view is obtained of several inches of the hollow organ, the lumen expanding and narrowing slightly on inspiration and expiration respectively. On the left anterior wall may be seen slight bulgings due to the presence of the aorta and of the left bronchus—these are brought out prominently by artificial distention of the lumen with air. The position of the aorta, at first to the left, then to the back of the œsophagus, will be recalled by the pulsatile movements seen.

7. The length of the œsophagus varies greatly—even in the same individual under the varying conditions of the stomach. The distance of the cardia from the teeth varies from 14 to 20 inches; but Brünings, from collation of the figures of many authorities, arrives at 16 inches as the commonest length in man, 15 in women, about 13 in the child of fifteen, and about 11 in the child of six. The distance from the teeth to the œsophageal ostium is in adult man 15 cm. (6 inches), in women 14 cm. (5½ inches), and in the child of six 11 cm. (4½ inches).

The rapid appreciation of the metric values in their English equivalents is much facilitated if it be remembered that, roughly speaking, a metre=40 inches, a decimetre or 10 cm.=4 inches, a centimetre=$\frac{4}{10}$ inches, and a millimetre=$\frac{4}{100}$ inches. Thus 11 cm.=$\frac{44}{10}$ inches, and 17 mm.=$\frac{68}{100}$ inches; these are figures which readily convey an idea to the British mind.

METHODS OF EXAMINATION.

Hypopharyngoscopy.—The lower portion of the pharynx, that which remains hidden from view in the laryngoscopic picture by the apposition of the base of the arytenoids to the posterior wall, can be brought into view by von Eicken's method. After the interior of the larynx has been anæsthetized with cocaine, the laryngeal mirror is inserted in the usual way, the patient craning his neck forward from the shoulders. A strong curved probe, armed at the tip with wool or a rubber covering, is inserted between the cords, and the larynx is drawn bodily away from the spine with a firm pull. A view is thus obtained for a few seconds of the posterior surface of the cricoid and of the cavity of the hypopharynx down to the œsophageal ostium. A better view may be had, and a more prolonged examination made, by Killian's suspension method (*see* p. 341), coupled with retraction of the larynx from the spine. This latter manœuvre may be accomplished conveniently by tilting the cricoid forward first on one side then on the other by inserting a flat, blunt-edged instrument into the hypopharynx and rotating it upon its long axis. A careful and prolonged examination of the lower portion of the hypopharynx, such as is required for the determination of the lower limits of a malignant growth, is best made by the ordinary direct method, a broad tube spatula being employed.

Direct Laryngoscopy.—As a rule this is accomplished in the adult under cocaine anæsthesia and in the sitting position. With a small swab wet with equal parts of cocaine (20 per cent) and adrenalin (1–1000) a sweep is made over the base of the tongue, and the posterior surface of the epiglottis is then carefully painted. A second application is made to the whole interior of the vestibule, including the vocal cords. A third application may be necessary, and in irritable subjects bromide may be given for three days, or morphia ($\frac{1}{6}$ gr.) one hour before operation. The operator stands before the patient, who is seated on a low stool and leans forward at an angle of about 45° to the perpendicular. The surgeon, grasping the handle of the electroscope firmly in the left hand, gently inserts the tip of a tube spatula into the larynx, and with a rotary movement round an axis transverse to the tube (in which the upper teeth must on no account be allowed to play the part of fulcrum) he draws the epiglottis forward, the whole manœuvre being directed under visual control. In many cases the anterior half of the glottis will remain hidden from view until with his right hand the operator (or assistant) presses the anterior surface of the cricoid cartilage back towards the spine. Mosher's or Hill's tube spatulæ, which are open at one side, facilitate the use of probes and forceps held by the operator in his right hand.

Spastic closure of the glottis is readily overcome by passing the flat handle of a probe through the glottis, and rotating it on its long axis through 90° into the transverse position. The same effect is attained by passing Paterson's forceps into the glottis and opening the blades. A small-size bronchoscopic tube may also be passed; but this completely obscures the view for the time being.

At the present time surgeons who find frequent occasion to attack the larynx by the direct method make use of Killian's suspension laryngoscopy. The apparatus, which is still in process of evolution, need not be described here; let it suffice to say that the patient lies recumbent with his head over the edge of the table; a straight spatula suspended from a gallows supplied with screw movements for fine adjustment is inserted into the larynx, and the weight of the head serves to retract the tongue, epiglottis, etc., and prevent them from obstructing the view. By this means the operator is left with two hands free for delicate work. Some such apparatus could readily be improvised, but in practice it is found that the fine adjustments form a necessary element in the successful use of the principle of suspension laryngoscopy.

In children, thanks to the high position of the larynx, a momentary view can often be obtained by the direct method without general anæsthesia; but here, as in all laryngeal manœuvres, the preparations for cricothyrotomy or tracheotomy should be complete.

It may here be mentioned that in ordinary laryngoscopy with the mirror, the base of the tongue in young children should be hooked forward, either with the finger or a spatula with a down-curved end—e.g., Lack's.

Inferior Tracheobronchoscopy.—Examination of the parts through a tracheotomy wound is a very simple matter, provided that the thyroid isthmus has been divided, that the tracheal opening is low, and that the manœuvres are carried out at the time of the tracheotomy, i.e., before the trachea has become fixed deep in the neck by adhesions. When delay is imperative, the edges of the tracheal fistula should be stitched to the skin, two or more tracheal cartilages being included in the sutures. Inferior bronchoscopy is the method of choice in dealing with very large and sharp foreign bodies, or with those likely to break up when seized in the forceps.

Peroral Tracheobronchoscopy and Œsophagoscopy.—It is impossible in a few paragraphs to give anything like a complete exposé of a subject which can readily occupy a volume; it must suffice here to indicate the guiding principles, supplemented by a few practical hints.

Anæsthesia.—The manœuvres are not painful, but they make a heavy demand on the morale of the patient; therefore general anæsthesia is almost essential in children, and very often required in adults where any prolonged retention of the tube is likely. In a good adult subject cocaine anæsthesia is quite sufficient, and may be preceded by a dose of morphia ($\frac{1}{6}$ gr.) and atropine ($\frac{1}{120}$ gr.) given an hour before operation. The latter drug is helpful in that it diminishes the secretion of mucus and saliva. The dazed condition induced by scopolamine and morphia is preferred by some surgeons. In any case, the local application of cocaine is necessary to allay purely reflex phenomena; it must be applied carefully to the laryngeal vestibule, the carina, and the ostium of the œsophagus, and specially to the inflamed or irritated area round an impacted foreign body.

In all local anæsthetic cases the patient must be assured that the tube shall be removed directly he indicates that its presence has become intolerable—and this moral compact should never be broken. Two slaps of the hand upon the thigh serve as a useful, because natural, sign, while one slap may be employed to indicate painful pressure upon the lips or teeth, a matter easily put right by a slight adjustment.

For general anæsthesia ether must be avoided, as it induces hyperæmia and secretion, and increases the risks of pulmonary complications. In the writer's opinion chloroform is the anæsthetic of choice for these cases.

Needless to say the stomach should be empty in every case.

Posture of Patient.—For the direct examination of the larynx, trachea, and hypopharynx in adults, the sitting posture is the more convenient for both surgeon and patient; for prolonged examination of the deeper parts, the lying position is preferable, but by no means essential.

When the long tubes are to be used, the important point to bear in mind is that the upper teeth have to be brought as nearly as possible into line with the lumen of the trachea or œsophagus, and, as a corollary, that the spine should be as straight as possible. This does not by any means imply that the back should be 'straightened' as that term is generally employed; on the contrary, the normal curvatures have to be effaced so far as possible, and the attitude of choice is that approaching the posture of a cyclist leaning over his handle-bars.

In the case of a sitting patient, he should be seated on a low stool without a back, and should bend forward from the hips at an angle of about 45°, the position being retained by a nurse standing behind him with her knee against the small of his back. The neck is craned forward somewhat from the shoulders, so as to bring the cervical into line with the now straightened dorsal spine ; while a little additional space is afforded by extension at the atlo-axial joint, the patient looking up towards the ceiling. This latter movement must, however, be but slight, otherwise curvature of the cervical spine as a whole will result.

In the lying posture which is employed in chloroform cases, the same principles are involved. The decubitus may be dorsal or right-lateral, and in either case the head is drawn over the end of the table and supported on an adjustable head-rest or by a nurse whose whole attention must be directed to this duty, often an arduous one. She should therefore be seated at the left of the patient's head, and arrange a footstool of suitable height so that she may support upon her left knee the weight to be carried. Her right hand is placed upon the patient's forehead, her left under the occiput, and once in position she must not relinquish her hold. In a patient with a spine of normal flexibility, and with upper incisors not unduly prominent, the tubes may be passed into the bronchial branches and into the stomach without excessive pressure upon the teeth. The right-lateral posture, however, affords special advantages in œsophagoscopy and in the examination of the left bronchus. The tube is passed through the lower angle of the mouth (i.e., by the right upper molars), and is thus already furnished with a slight leftward deflection, which is especially valuable when the diaphragmatic portion of the œsophagus has to be traversed, slanting as it does towards the left side. The lateral posture, moreover, facilitates the drainage of saliva out of the corner of the mouth, and thus prevents its passage into the larynx and trachea. Both in the dorsal and lateral decubitus the straightening of the spine is rendered easier if the thighs are flexed upon the pelvis.

Manipulations.—Before commencing, all preparations must be complete. The surgeon, who either stands or sits according as he is dealing with a 'stool' or 'table' subject, places the instrument table at his right hand, with instruments within easy reach and arranged parallel to one another so that one may be picked up without disturbing the rest. Besides the extension-tubes and forceps, he will prepare a dozen swabs on holders (very securely fixed), and a cup of cocaine and adrenalin. If a second assistant is present, he must be shown how to make swabs which are really secure, taught the names of the instruments, and instructed to hand them at a suitable angle.

The operator's right hand must remain free for delicate manipulations ; the left, therefore, must hold the electroscope and perform the somewhat strenuous function of rotating the instrument round an axis transverse to the long axis of the tube. This rotation requires a fair degree of energy, for the patient's teeth must by no means be utilized as a fulcrum whereby to gain mechanical advantage.

It is of the essence of the direct method (and unless this principle is realized the method is fraught with many and great dangers) that the tubes must be introduced under visual control. In Brünings' instrumentarium will be found a set of gum-elastic mandrins intended to facilitate the introduction of the œsophagoscope in cases where the condition of the ostium is known to be normal and healthy—but even then only in the hands of the expert. For those who seek instruction in this short article, their use is inadmissible on all occasions.

We shall now proceed to consider the manipulations necessary (1) In tracheobronchoscopy (*a*) with the patient sitting, (*b*) with the patient lying ; and (2) In œsophagoscopy.

1. *a.* Tracheobronchoscopy with Patient Sitting.—The patient being cocainized, the operator firmly grasps in his left hand the electroscope, having pulled out the slide-stem to its full length if forceps are to be used, or leaving the slide 'home' if a fugitive examination alone is contemplated ; in either case centring and focusing the light to suit the circumstances (*see* p. 337). A suitable tube spatula is fixed, warmed, and lubricated, and its corresponding extension tube (perforated in the case of bronchoscopy) is also prepared and placed within easy reach. The mouth is gagged open, and the lips and teeth protected with a cloth or sheet of rubber.

As the spatula is introduced, the surgeon will see through its lumen the uvula first, and then, as he rotates the instrument more into line with the patient's long axis, the tip

of the epiglottis. At this moment the first, and perhaps the only puzzling, difficulty arises. It must be remembered that at the approach of the instrument the laryngeal vestibule instinctively takes up a defensive attitude, and, by contracting, not only approximates its sides but also its anterior and posterior walls ; that is to say, the epiglottis is drawn back, and the tips of the arytenoid eminences are drawn forwards almost under cover of the epiglottis. Thus the picture observed through the tube is of the posterior aspect of the arytenoids, and the tyro in bronchoscopy often falls into the error of passing the tube down into the hypopharynx. Immediately, therefore, the tip of the spatula has passed the upper edge of the epiglottis, the act of rotation must be made, and the vocal cords will at once be brought into view. If now the patient be encouraged to breathe quietly and regularly, the spatula may be gently coaxed through the glottis during inspiration, and so soon as an inch or two of spatula has passed this point the strain upon the left wrist will be relieved. Where spastic closure occurs, it is only necessary to rotate the spatula on its long axis until its narrow lip can be inserted between the cords. I would emphatically urge beginners always to make use of two hands in these more delicate movements ; that is to say, leave the levering work to the left hand, and with the right index and thumb hold the shaft of the spatula and gently push it downwards through the glottis. This bimanual method is of special importance in passing the œsophageal ostium.

Once the spatula is well in the trachea, an excellent view should present itself of the whole of that viscus and of the upper segments of the bronchial tree ; if such a view (granted a healthy trachea) is not obtained, the operator may assume that the spatula is not truly alined with the tracheal axis and that more leverage must be accomplished by the left hand. The carina is now painted with cocaine and adrenalin, the lamp-carrying portion of the electroscope is turned to the left, and the extension tube inserted. The latter is now gently introduced into the bronchi, easily into the right, with more difficulty into the left, which must slowly be straightened out by the advancing rigid tube. During this latter process the pulsations of the aortic arch, which crosses above the left bronchus as it leaves the trachea, will be felt by the operator. Sticky mucus is best removed by a rotary movement of the swab ; and when the suction tube is employed to remove copious secretions, its tip should be dabbed gently upon the surface to be cleansed, otherwise the mucosa or granulations may obstruct the orifice. The suction apparatus can be hooked on to the operator's overall.

b. Tracheobronchoscopy with Patient Lying.—When the patient is lying upon his back or right side, the operator must stand up to start the insertion, and gradually find his chair as the tube comes down into its final horizontal position ; his left arm will of necessity lie across the patient's face, knuckles uppermost. In a prolonged case it is rather tiring to keep the arm raised, but the rotary power of the wrist is very great in this attitude. The strain upon the raised arm may be avoided by adopting the left lateral posture for the patient, but this is disadvantageous on other grounds ; and Brünings, who advocates this posture in some cases, subsequently turns the patient over, a manœuvre which, without plenty of assistance, is unsafe.

The anæsthetist stands at the patient's left hand, and must be warned not to obstruct the operator's view by inserting his chloroform tube into the line of vision at inopportune moments. The small mirror must be cleansed from time to time as expectoration is coughed upon it, and in all septic cases the operator should protect his eyes with spectacles. Slightly 'plus' spectacles are advantageous from an optical point of view, and the small telescope to be obtained with Brünings' set is valuable in some cases.

No description is required of the passage of tubes into the bronchial branches—suffice to say that it is impossible to obtain a view of the whole of the eparterial bronchus without reflecting or refracting instruments.

2. Œsophagoscopy.—Œsophagoscopy is conducted on lines precisely similar to those of tracheobronchoscopy, and either local or general anæsthesia may be employed. It is held to be a more difficult and dangerous procedure than the latter, and many more accidents have resulted from it. There is no reason why this should be the case if the principle of constant visual control were rigidly adhered to, and if all abnormal appearances were regarded as danger-signals. Formerly the blind introduction of the œsophagoscope guided by a mandrin was the rule ; clearly such a manœuvre is a good

deal more dangerous than the passage of the old flexible bougie, and that instrument has been responsible for its full quota of deaths. The form of Brünings' tube spatula renders the use of these mandrins quite superfluous.

The preparations are much the same as those for tracheobronchoscopy, except that the cocaine swab is carried into the hypopharynx instead of into the larynx, after the tongue and uvula have been painted.

As a general rule the right angle of the mouth is the easier route, and right lateral recumbency the most suitable posture ; but in a patient with deficient upper incisors the mesial route is easy. The lip of the spatula is passed down behind the arytenoids, which are readily identified by their respiratory movements, and the instrument is wriggled down with a slight rotation upon its long axis until the cricoid constriction is seen. At this point surgical judgement comes into play, for it is through the forcible passage of this ostium that the majority of accidents occur. The ostium must be well and quietly examined, and if necessary a probe be used with a delicate side-to-side movement to determine the exact position of the lumen. If a cocainized patient is requested now to make the act of swallowing, the ostium will momentarily open and the tube may be popped through. I strongly deprecate this manœuvre at the first examination of a case—until, in fact, the upper end of the œsophagus is known and proved to be healthy. This *tour de maître* has repeatedly given rise to accidents and mistakes, for the instrument is made to shoot suddenly past the very region where disease and small foreign bodies are most frequently located. I therefore would strongly urge the reader always to make the passage of the ostium by a slow, sliding movement, and under the keenest visual control. With the power of the left wrist the cricoid cartilage should be retracted from the spine, while at the same time the index and thumb of the right hand supply the very firmly controlled downward pressure, the two hands adding a slight rotation of the spatula to and fro on its long axis. The friction to be overcome really amounts to that resulting from backward pressure of the cricoid against the tip of the spatula, added to that of the teeth pressing its butt-end forwards or to the side. This fact is made evident if too short a spatula is used on a long-necked man—it has happened to me to see the butt-end of the instrument unexpectedly slip on into the mouth, while at the same moment the tip has readily shot through the ostium precisely in the manner I wish to deprecate. Once the ostium is passed, the examination of the œsophagus in a normal patient is exceedingly easy, granted that the spine has been suitably straightened by flexing the thighs upon the pelvis. So soon as the thorax has been entered, several inches of an almost cylindrical hollow cavity are seen ahead of the instrument ; and if this is not the case, one may assume that the instrument is not properly alined and that the posterior wall alone is in view. The size of the lumen will be seen to wax and wane on inspiration and expiration respectively, and peristaltic movements may be observed ; but closure of the lumen, except in the neighbourhood of the ostium and at the hiatus, may be regarded as pathological. The tube meets with but slight resistance at the hiatal opening, and seems almost immediately to enter the stomach, near the posterior wall of that organ.

Contra-indications and Dangers.

In the presence of fixation of the jaw, and of marked lordosis of the spine, peroral œsophagoscopy and tracheoscopy are impossible. In the case of large, jagged foreign bodies firmly impacted in the larynx, less damage will be done by the very simple operation of laryngo-fissure (*see* Larynx, Malignant Disease of) than by fruitless attempts at peroral removal. Similar bodies in the trachea, and also highly friable bodies, are best attacked by the inferior method, i.e., after tracheotomy.

In general terms it may be said that there are no genuine contra-indications to the removal of foreign bodies from the air-passages. For example, the presence of septic pneumonia should hasten rather than delay the attempt at removal, and the same may be said of a case moribund from slow asphyxia. I would quote in the latter connection a case where, after secondary hæmorrhage following laryngectomy, the patient slowly sank and collapsed and was deemed by a skilled nurse to be dead. The passage of the tube showed that the patient had for some time been breathing through a small hole in the centre of a diaphragm of dry blood-clot occupying the lower end of the trachea. A few minutes after removal of the clot the pallor disappeared and the patient was

practically well. In this, as in similar cases, there was pallor and no cyanosis. Even the presence of a large aneurysm is not a genuine contra-indication to tracheoscopy ; for even should the tracheal rings have been absorbed, the bulging aneurysm with its wave-like pulsation can readily be seen, and its region studiously avoided ; such a case entails precisely the same minute care that every case should receive.

Special dangers and difficulties may arise in the attempted removal of foreign bodies, and these must be weighed against the danger of leaving matters *in statu quo*, not forgetting that the *status* may at any time change, either through the shifting of the object, the penetration of the walls, or the onset of septic phenomena—and in this latter connection one may say that, of all the more common foreign bodies, decayed teeth are, more than any other, likely to set up septic pneumonia.

In all cases the dangers are minimized by the presence of tracheotomy and cricothyrotomy instruments, and in many cases it is best to lay bare the trachea as a preliminary measure. This is specially important where a foreign body too large to be drawn into the tube has to be withdrawn, naked, through the glottis. In removing a body from a bronchus, the utmost care must be taken that it is not cast adrift from the forceps and inhaled into the other bronchus, thus possibly putting both lungs out of play simultaneously.

For purely diagnostic purposes, the direct examination of the œsophagus must be approached with considerably greater caution than is necessary in the case of the trachea ; the œsophageal picture is more difficult to interpret, and the mucosa far more delicate and hæmorrhagic. Cirrhosis of the liver entails the danger of profuse hæmorrhage from the lower section of the gullet, and aneurysm is generally regarded as a definite contra-indication. Certainly the tube should not be passed soon after the swallowing of corrosive poisons. The existence of fever spells danger ; and if it is accompanied by persistent pain (not merely on deglutition) and surgical emphysema, mediastinitis must be dealt with *ad hoc*. The mortality from the removal of foreign bodies by œsophagotomy is very much greater than that following the endoscopic method. In a case of œsophagitis with fever which remains stationary or decreases, and where the history, symptoms, and skiagraphy leave the surgeon in doubt as to whether the case is, or is not, one of mere laceration, an expectant attitude may be adopted. Similarly, in doubtful cases occurring in patients with disease of the respiration and circulation, the surgeon should withhold direct examination, and await more definite indications. This is a matter for the general surgical judgement, and it may be said here that more cases are lost from undue delay than from carefully conducted, but fruitless, examinations. The presence of malignant disease is no contra-indication to the method, granted that the tubes are inserted under visual control, and only down to, and not into, the diseased regions. I do not know of any untoward result where these two principles—i.e., continuous visible control, and consequent avoidance of diseased areas—have been adhered to strictly.

NATURE, DETECTION, AND TREATMENT OF FOREIGN BODIES.

1. In the Air-passages.—From the surgical standpoint foreign bodies may be divided into classes according to their physical qualities : for our purpose it will suffice to consider that they may be smooth, jagged or sharp-pointed, tough or friable, hard or soft, and particularly that they may swell on imbibing moisture. Some are septic at the outset, but all may set up septic phenomena. Statistical tables may be found of these various classes ; but seeing that at the present time only a small proportion of the innumerable cases occurring are being recorded, it is unnecessary to do more than allude to them.

It is more important to consider that the physical qualities often determine the course taken by the case. For instance, a pin lodged in a bronchus may cause no more trouble than a persistent dry cough ; but a bean in the same position will inevitably, by swelling, produce atelectasis of the lung ; while a septic tooth will speedily cause a spreading septic bronchitis ; so it comes about that in certain cases the presence of a small foreign body may be well tolerated for months or years, while in others severe dyspnœa on exertion is a prominent symptom, and in yet others, spreading septic bronchitis supervenes within a few days. I said above that all cases are in a sense urgent, but in point of fact quite a considerable proportion become chronic cases ; that is to say, a mere persistent cough

or a bronchorrhœa exists which may be tolerated with but slight impairment of health for a long time ; but the condition is always associated with the danger of severe and fatal exacerbation. Where a foreign body has been impacted for a length of time in the bronchial tree, it is often surrounded by granulation tissue, and may even be hidden by a cicatricial stricture ; such cases may prove extremely difficult to treat, and should not be attacked without a more extended knowledge than can be gained from this article, the purpose of which is to prevent the occurrence of such cases by indicating means of immediate removal.

The symptoms of foreign body in a bronchus may be elusive. After the reflex cough following the initial aspiration, nothing may be observed for a day or two, when persistent cough and perhaps pain may result from the local irritation. Even when one lung is completely put out of play, cyanosis may not occur except on exertion. The recurrence of fits of coughing, with intense laryngeal dyspnœa, alternating with periods of ease, indicates a foreign body lying free in the trachea and occasionally blown up to the glottis. Such cases are fraught with special danger, and the patient must not be left by the surgeon until the condition is relieved.

The diagnosis in all these cases must be arrived at on general lines. The history, unfortunately, is often misleading, as a very large proportion of cases occur in young children. The chest is to be examined for unilateral impairment of movement ; for diminution of breath sounds and vocal resonance ; and dullness to percussion, indicating a spread of the bronchial inflammation to the periphery, must be sought for. Both diagnosis and localization may be determined by the x rays, which will also indicate the size and character of the foreign body where this is opaque to the rays. A negative result, either with the screen or the skiagram, is not conclusive, as statistics certainly prove ; and it must be remembered that the respiratory movements serve to obscure the outlines of the shadow. In many cases the x rays are of the greatest service, not only in diagnosis but as an operative adjunct ; for the tubes and forceps may be passed, while a second observer watches their approach to the foreign body in the fluorescent screen.

By surgeons unaccustomed to direct-vision methods, it may be taken as a wise rule that in small children all foreign bodies should be removed through a tracheotomy wound. Frequently the object is expelled as soon as the trachea is opened ; if this does not occur, it is preferable to work through a broad short tube rather than rely upon the peroral route and upon a 7-mm. bronchoscopic tube of some length. At all events the difficulties are such that, until expertness is gained, the trachea should be laid bare before commencing manipulations. In adults, also, the inferior route should be adopted where the foreign body is large and jagged, or where it is likely to break up when grasped by the forceps ; and some authorities go so far as to say that such a body as a bean softened by a few days' retention should always be approached by this route. In the majority of adult cases, however, the peroral route will prove quite satisfactory. Before attacking any case the operator should, if possible, practise picking up through the tube a body similar in size, shape, and position to that in question. Such practice largely removes the difficulty which arises from the foreshortening of the bronchoscopic picture, and shows him in some measure how and where best to seize his quarry. An object such as a nail will generally lie point upwards, and this point must be drawn within the lumen of the tube before extraction is made. Great care should be taken not to lose hold of the object by fruitlessly attempting to drag into the lumen some portion of it which is too large to enter. The seizing and the extraction should therefore be made with the greatest care, and deliberation and special caution are needed at the moment when the glottis is to be passed.

As a general rule the mouse-toothed forceps will be found the most serviceable, but for seizing a pin the pair with flat blades set at a right angle should be used. In all cases the blunt hook is a serviceable instrument, enabling the operator to turn such an object as the large end of a collar-stud so that an edge presents and affords a hold for the mouse-toothed forceps. Beans are universally recognized as objects particularly difficult to grasp, more especially as with a little swelling they tightly fit the bronchus of a child.

In every case the ingenuity of the surgeon will be put to some test, but in the large majority he will be entirely successful. A few cases have baffled the most experienced operators ; and if the object is deeply seated, bronchorrhœa profuse, and granulations

abundant, perhaps no more difficult manipulations can be met with in surgery. If the view is obscured by blood in spite of adrenalin applications and of the frequent use of the suction tube, the operation had best be abandoned temporarily; for experience shows that repeated and short attempts at removal are fraught with less danger than very prolonged manipulations—though in point of fact reactionary swelling of the larynx is rare, even in children. Prolonged attempts, in the presence of impaired respiration, have been followed by fatal collapse, whereas manipulations occupying ten to fifteen minutes seem to be tolerated quite well even in bad subjects. One of the chief difficulties to contend with is reflex cough; the carina, and especially the inflamed area about a foreign body, therefore, should be well cocainized even under chloroform anæsthesia.

2. **In the Œsophagus.**—Bodies are impacted in the gullet by reason of their excessive size, or by the engagement of one or more sharp points or edges in the mucosa. A large mass of meat may be gripped tight in the œsophageal ostium and require some degree of traction for its removal. The commonest object, however, is a halfpenny which engages in the cricoid constriction. In either case difficulty in swallowing is experienced at a point easily localized by the patient and without accompanying pain. In the case of the coin, drink and well-chewed food may pass, and the obstruction be tolerated for many days. It is common knowledge that innumerable needles, nails, and so forth are swallowed, and pass without trouble *per vias naturales*, or become impacted only in the rectum. When ingestion of such objects is suspected, the swallowing of a bolus of tenacious food is the recognized treatment, granted that pain is absent. Where penetration or laceration of the mucosa is indicated by pain, an endoscopic examination should be made. There are exceptions to this rule; the presence of fever and of surgical emphysema contra-indicates the use of the tubes; but I wish to suggest that the day has now passed when bougies should be used blindly in the hope that they may dislodge and thrust on a foreign body. Every doctor is aware of cases within his own hospital experience in which the blind use of œsophageal instruments has caused fatal consequences; and wherever pain suggests the presence of a sharp foreign body these manipulations should be considered inadmissible, it being a mere chance whether or no fatal mediastinitis is to result from their employment.

In the case of a coin recently impacted at the cricoid, and located by *x* rays, the coin-catcher should prove a harmless weapon; but in the case of sharp bones, dentures, and so forth, neither the bougie nor the umbrella-probang should be employed.

Fig. 31 depicts a fish-bone two inches in length which was removed with the greatest ease by the direct method from an intelligent patient who was suffering great pain after swallowing 'a small fish-bone'. For the purpose of the sketch it has been placed in the œsophagus of a cadaver in the position which it occupied in the actual patient. A glance will show that attempts to remove this foreign body with the umbrella-probang must have ended in failure or in severe laceration.

Fig. 32 is the diagrammatic representation of a fragment of pigeon-bone deeply embedded in an ulcer just below the cricoid constriction, from which it was readily removed by the direct method. The object has been so far pressed into the mucosa of the left side of the œsophagus as to be almost invisible through the lumen of the tube spatula. The passage of a bougie would merely have pressed it deeper into the inflamed tissues.

In many cases the bougie and probang can no doubt be employed with safety and success, either to thrust the foreign body into the stomach or to extract it; but it may fairly be said that in no case, with the possible exception of a coin quite recently engaged in the cricoid constriction, can the blind method be claimed as perfectly safe; while if it fails to relieve the patient, it can merely indicate the seat of the impaction and nothing more. I have seen even a bolus of meat and gristle so securely grasped by the sphincter muscles of the ostium that considerable traction was required to withdraw it. It was so placed that had a bougie been blindly passed, its tip must inevitably have been directed into the larynx.

Large, rugged, sharp-pointed bodies are better extracted by œsophagotomy (if impacted high up) or by gastrotomy (if in the lower segment). Chevalier Jackson claims that anything that has passed down through the ostium can be extracted by the same route; Killian is of the contrary opinion.

At the same time it must be remembered that the mortality after œsophagotomy is fairly high. An incision is made at the anterior edge of the left sternomastoid, and the side of the trachea is reached after slitting the deep fascia on a blunt (e.g., Kocher's) director, and retracting the thyroid gland and great vessels to either side of the field. The recurrent laryngeal nerve in the angle between the trachea and œsophagus must be respected, and the wall of the œsophagus, recognized by its longitudinal muscle fibres, is then drawn forward and opened by a longitudinal incision, and the finger introduced. After removal of the foreign body, the wound in the viscus is carefully closed by three layers of Lembert sutures. A perfectly watertight closure capable of resisting the strain of vomiting and deglutition is difficult to obtain; therefore the neck wound should be kept widely open and packed with gauze until granulation has created a barrier against spreading sepsis—which is the cause of the high mortality after this operation.

The very large majority of impacted foreign bodies are found in the region of the ostium,* but some occur about the tracheal bifurcation, some near the diaphragmatic hiatus. In the latter event gastrotomy may be necessary, and removal conducted with the aid of peroral or of retrograde œsophagoscopy. Retrograde œsophagoscopy should

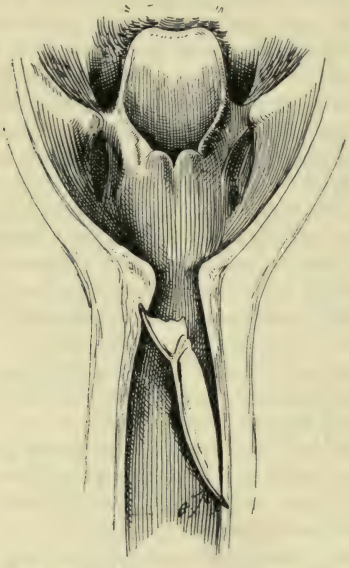


Fig. 31.—Fish-bone in œsophagus. Actual case reconstructed to illustrate the danger of bougie or umbrella-probang when used blindly.

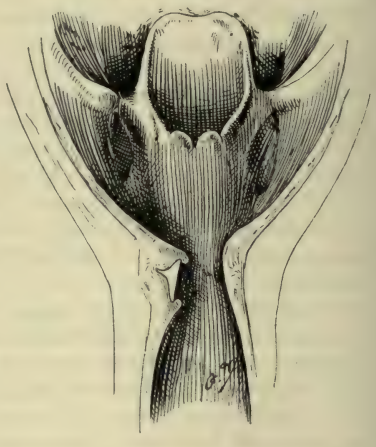


Fig. 32.—Fragment of bone embedded at œsophageal ostium. Actual case reconstructed to illustrate uselessness of bougies.

be conducted only after suturing the stomach wall to the abdominal parietes. If the finger is used, the stomach wall should be secured round the base of the index finger with a purse-string suture, and the object displaced into the stomach by cautious palpation.

When doubt exists as to the wounding of the œsophagus, either before or during endoscopic manipulation, only iced and sterilized liquid food or jelly should be given, and milk is better avoided. Small doses of 3-vol. peroxide may be sipped every hour.

This article, which deals at some length with certain details, and even repeats more than one point, in fact only touches the fringe of what has now grown to be a subject of considerable surgical importance. There are many different systems of tube construction and of illumination, and in America, for instance, where the admirable work of Chevalier Jackson is followed, the illumination is obtained from a minute lamp placed at the distal end of the tube. This article does not purport to serve as a primer for the young bronchoscopist (he will find an admirable work in Brünings' *Direct Laryngoscopy, etc.*, translated by Howarth), but as a practical guide to the general surgeon, in charge, say, of a small

* *See* Burger—StClair Thomson, *Diseases of Nose and Throat*, 1912.

colonial hospital, who has many more important duties to perform ; and if it be written intelligibly, it should, coupled with a set of instruments, enable him to deal endoscopically with nine out of ten cases of 'acute foreign body'. I venture to repeat that the subject is not a highly technical, nor in any sense an ocult, one ; and that any skilful surgeon with a steady hand and keen vision may attack the great majority of these cases with confidence, granted he adopts a certain frame of mind—one, that is to say, of extreme precision, deliberation, and caution. *E. B. Waggett.*

FOREIGN BODIES IN STOMACH.—(*See* STOMACH, FOREIGN BODIES IN.)

FRACTURE SPRAINS.—(*See* SPRAINS.)

FRACTURES.—(*See also* NOSE, JAW, SKULL, SPINE.)

I.—GENERAL PRINCIPLES.

The changes which have taken place in recent years in the treatment of fractures may be traced : (1) *To the use of the Röntgen-ray shadow* for revealing more or less accurately the position of the broken ends of a fractured bone before and after treatment ; (2) *To the introduction of the antiseptic method* of treating wounds, whereby, when efficiently carried out, the injured parts can be exposed to view and directly dealt with, without undue risk to the patient ; (3) *To the adaptation of massage and movement* to the treatment of fractures, a method which has been worked out by Professor Lucas-Championnière in Paris.

1. The *Röntgen rays* when employed to examine injured bones and joints have shown many points of much interest and value. Besides establishing or refuting a diagnosis of fracture in doubtful cases, they have revealed the presence of fracture where it was not supposed to exist. They have, moreover, taught us that the ends of the broken bones are seldom in accurate apposition even in cases where the functional results have been found satisfactory ; while in cases where these results have been unsatisfactory, they have shown why it has been so. Although surgeons were at first shocked to find that their efforts at reduction and retention were less effectual than they had supposed, they have learned, and are still learning, to distinguish between imperfect union which is functionally important and may require operation, and imperfect union which is functionally unimportant and may be ignored.

2. In like manner, the *open method* of dealing with simple fractures has led to a clearer knowledge of the relation of parts in certain cases of fracture, and thus has enabled us better to distinguish the few cases that require operation from the many that do not.

For the majority of the members of the medical profession who are engaged in general practice, the use of a Röntgen-ray apparatus is not easily obtained. Comparatively few, moreover, have sufficient time or suitable opportunity to enable them to practise antiseptic surgery with that certainty of success which alone would justify their opening up simple fractures. It is, however, none the less important for the general practitioner to be able to recognize the cases that are likely to require these special procedures for diagnosis or treatment : he can then call in the help that he needs. Fortunately, such cases are comparatively rare, and we shall try, when indicating what seems to be the best method of dealing with the various fractures of individual bones, to point out those cases for which the services of a Röntgen-ray specialist, or hospital surgeon, are likely to be required.

3. With regard, however, to the *massage and movement method* of treating fractures, the case is different. With very few exceptions, every fracture in the body can have this method applied to it with much benefit to the patient, the principles of the method can be easily understood, and the practice can be learned by any member of the medical profession without going through a special course of study. Medical men in busy practice may not be able to give the full amount of time required, but when they understand the advantages their patients will gain in shortened time off work, and in improved functional results afterwards, they will find ways of securing for their patients at least a large proportion of the full possible benefit.

The methods of treating bones of the extremities which were universally accepted twenty years ago, and are still practised by many surgeons, were based upon the

supposed necessity of absolute immobility of the broken ends of the bone until the callus was well formed. This supposed necessity for immobility was looked upon as the first principle, and as a corollary to it there stood the rule that the apparatus which fixed the broken ends of the bone should at the same time fix the joint above and the joint below.

The period during which this immobility was maintained varied from about three weeks to three months or longer, depending upon the bone broken, and the age and healing power of the patient. After the bones had united, the return of the limb to functional usefulness was taken into consideration, but not before. It was then found that the weakness and stiffness of the muscles, and the limited range of movements of the neighbouring joints, often more than doubled the period of functional disability of the injured limb which the treatment of the fracture had already involved. In many cases the functional disability was permanent. These troubles were, however, considered to be inevitable consequences of the fracture—evils indeed, but less than those associated with the non-union which would have resulted from too early release from splints. The bad results obtained by prolonged immobility form a striking contrast to the good results obtained by immediate operation in the hands of competent hospital surgeons, and on this contrast has been founded the main argument for frequently operating in recent simple fractures. Fortunately, however, an improvement in the non-operative method of treatment now enables the general practitioner to obtain functional results equal to those obtained by operation in a large number of cases in which prolonged immobility ended in permanent disability. We know from the experience of Professors Lucas-Championnière and Guermonprez and others in France, and from that of Sir William Bennett, Mr. Wharton Hood, and many others in this country, that the supposed axiom of the necessity for absolute immobility to insure bony union was not an axiom at all. It was only an erroneous opinion, and we now have other opinions which seem to be more securely founded, and on which is based a practice which gives better results. In formulating these opinions we shall not follow the exact views of any one of the surgeons to whom we owe them, since they differ from one another in detail. We shall try, however, to state briefly the general conclusions at which we have arrived after studying the most important published works upon the subject, and after having had personal experience of the methods in hospital and private practice. These may be briefly stated as follows :

1. Absolute immobility of the broken ends of bone is not essential to bony union. The ribs unite in spite of the movements of respiration, and wide experience has shown that the slight amount of movement necessarily involved in the daily massage of a fractured limb, and in the daily active and passive movement, for a few minutes at least, of the adjacent joints, seems to hasten rather than hinder the formation and the solidification of the callus.

2. Extravasated blood in joints and among muscles and synovial sheaths leads to adhesions in its neighbourhood, as if it were in itself a source of irritation.

3. The use of massage in the form of stroking and gentle kneading, combined with occasional movements, is in several ways beneficial in the treatment of fractures. These measures not only aid the actual union of the bones, but help in the absorption of effused blood and serum, restrain if not prevent the formation of adhesions among the soft parts, and maintain the nutrition of the muscles. They therefore simultaneously hasten union and prepare the limb to return to functional use almost as soon as the bones are united.

4. Splints, and other retentive apparatus, including extension, are required more to prevent mal-union than non-union, and hence are called for especially where the weight of the limb or muscular action is likely to lead to a bad position during healing.

5. On this account, retentive apparatus should, as far as is consistent with its main object, not restrain the movement of the adjacent joints, nor impede the circulation of the limb, and it should be dispensed with as soon as possible.

6. The manipulations necessary for the massage and movement treatment of fractures can be successfully carried out by anyone who will take the trouble to understand the object of the manipulations, and who will be careful to avoid causing pain when he handles an injured and very sensitive part.

The principles laid down in the preceding paragraphs, which were enunciated some years ago, have received strong confirmation during the recent war in the treatment especially of fractured femurs.

As massage and movement are, for the reasons just given, so important in the treatment of fractures, it seems advisable that we should explain their use in a general way before we discuss the diagnosis and treatment of particular fractures.

Objects of Massage.—In a recent fracture, say from a few hours to a few days after the accident, the object of massage is to diminish the swelling, to allay muscular spasm, and to soothe pain. After acute symptoms have subsided, the object of massage is to stimulate the circulation of the limb, to disperse accumulation of blood and of serum—one or both—and to maintain the nutrition of the muscles, nerves, and soft parts generally. That massage has the power of fu'filling these objects after recent and old-standing injuries to the soft parts has been proved by clinical experience, and by experiments made upon animals.

Methods of performing Massage after Fracture.—In recent cases, after the patient has been put to bed, or otherwise placed in the most comfortable position which the circumstances permit, the affected limb must also be made comfortable. It should be laid on a pillow on the operator's knee, or merely on the bed, and arranged so that the operator can have easy access to it. The injured limb must be steadied by an assistant or by the operator with one hand while he massages with the other.

Where there is much pain, and especially where there is great spasm of the muscles which pass over the broken bone, a small hypodermic injection of morphia will be an advantage. Many patients are much relieved by fomentation of the limb with hot water. After this has been done, the skin must be dried gently with a soft towel, and then dusted over with some fine powder to facilitate the rubbing. Finely powdered talc is recommended by Dr. Dagron, but finely powdered boracic acid, toilet powder, or ordinary flour, will serve the purpose as well. The operator begins by gently stroking the limb, beginning on the proximal side of the injury and following the course of the veins towards the heart. In doing this he will employ as broad a surface of his hand and fingers as he can, and he will be guided as to the amount of pressure he uses by the sensations of the patient. *He must not cause the patient pain.* He will find that after a little he can extend the area of his rubbing, and press a little more firmly without causing pain, than he could at first. He will not be able to press over the seat of fracture itself, but may with advantage stroke towards it from below upwards. Where there is great tenderness of the injured limb, the massage should take the form of a series of light pressures successively applied from below upwards, and regulated as to strength by the sensations of the patient as before. Attention should next be turned to the muscles, and as the object at this stage of the work is to soothe and allay spasm, the simple rule is to massage all the muscles which pass over the seat of fracture or which act upon the broken bone. According to the degree of tenderness, the massage of the muscles will vary as before, from a series of caress-like touches to more firm pressures, or even very gentle kneading. Each muscle, or group of muscles, is taken by itself, and its fibres are followed as nearly as possible in the direction of the venous return. This should be succeeded by a repetition of the upward strokes, or light surface pressures, with which the process began. The length of time required varies from ten to twenty minutes, according to the circumstances. It will often be found that the sufferings of the patient have been so much relieved, and the muscular spasms so much reduced, by the massage, that it will be possible to dispense with a general anæsthetic in order to complete the diagnosis or set the fracture. Even, however, when a general anæsthetic is required, this preliminary massage should be employed to reduce effusion, before splints are applied. If movements are permissible they are then performed, and after that the retentive apparatus should be applied.

In some cases these procedures should be repeated daily at first, in others at intervals of one or more days, the splints being taken down for the purpose, and afterwards reapplied. The limb should be steadied as at first, but with less precision as the muscular spasm becomes less and the ensheathing callus more solid.

After the acute symptoms have passed off, the stroking movements are firmer and more extensive in their sweep; their object being, as before, to empty the veins and lymphatics, and so to stimulate circulation, and to get rid of any swelling which may remain. Where definite collections of blood or serum are present, the pressure may be applied to them more energetically so long as no pain is caused, either by a kneading or by a circular 'milling' movement of the hand or fingers. The stroking movements should

be repeated from time to time to empty the vessels. Attention should then be paid to the muscles. The object should be to gently stimulate the muscular fibre by pressure and kneading movements carried along from one end to the other. The sitting will be brought to a close in every case by a number of stroking movements.

When the fracture involves a joint or passes close to it, special attention should be paid to the ligaments, synovial membrane, and synovial sheaths, while stimulus to the seat of fracture itself should be avoided. The object is to get rid of effusion and prevent adhesions. Where cancellous tissue, well supplied with blood from both sides, is broken, we do not fear non-union. There is, however, risk of excess of callus, especially in a young subject. Hence the advisability of avoiding any stimulation to the seat of fracture by massage. This would increase the amount of callus and so embarrass the movements of the joint. When the broken part of the bone is within the capsule of a joint, one of the broken portions may have a very poor blood-supply, and then of course non-union will be the risk, but this seldom occurs except in the hip-joint, and not often there.

Movement as Part of the Treatment.—Some surgeons have asserted that it is practically impossible in the treatment of recent fractures to restrict passive movements within limits that do no harm. The extensive experience, however, of Professor Lucas-Championnière and others has proved that this assertion has no foundation in fact. Passive movements should, however, be understood to mean movement produced by the surgeon's muscles and not resisted by those of the patient. It will be of interest to contrast the effects of the two kinds of movement, so that we may to the best advantage make use of each in the treatment of recent fractures. Active movement can hardly fail to be the more effective agent in maintaining the nutrition of the muscle and of the limb generally. In so far, however, as the action upon the joint is brought about by a strain along the line of the tendons, and not by a force applied from the outside, there will be a greater tendency to displacement of the broken ends of bone in active than in passive movement. For this reason passive movements will often be permissible at an earlier stage, and their range of movement will be relatively greater until well on in the treatment. Passive movements will therefore be especially useful in preventing the formation of adhesions which bind muscles and nerves to one another and to the bones at the seat of fracture, and which cause synovial surfaces to adhere within joints and synovial sheaths. Each kind of movement, however, will have some of the special therapeutic action of the other ; thus, active movements will help to prevent stiffness, and passive movements will help to maintain nutrition. Moreover, many patients who are afraid to move a joint in the neighbourhood of a fracture will yet permit of gentle passive movement, and will be encouraged to make voluntary efforts when they find that passive movement does not cause pain. Both forms of movement require to be used with care, so as to avoid displacement of the broken ends of the bone, and pain or serious discomfort to the patient.

One possible advantage of active movement in the treatment of fracture not sufficiently appreciated, is the ability to utilize the patient's voluntary effort in the reduction of displacement due to muscular contraction. After the muscles have been soothed by massage, the patient can sometimes voluntarily replace a displaced bone. This use of voluntary action may perhaps be best illustrated in a case of Pott's fracture with marked displacement outwards of the foot by action of the peronei so as to stretch the skin over the internal malleolus. If the surgeon tries to pull the foot into position, the antagonistic muscles will start up in opposition and prevent him from doing so, while the patient will be caused very severe pain. If instead of this the surgeon gently steadies the foot and encourages the patient to lift it inwards, he will be surprised to find how much ground will be gained. The surgeon may then cautiously supplement the active movement with a little pressure in the same direction. Apparently the voluntary effort ensures relaxation of the displacing muscles along with the contraction of those that are helpful. The same method may be applied in a few other cases, working on the principle that when a group of muscles in spasm causes displacement, a relaxation of these contracted muscles will be induced by a voluntary contraction of the opposing group.

Is there any need for a Trained Masseur?—Professor Lucas-Championnière found that almost any intelligent person might be taught to carry out the manipulations requisite for his method of treatment. In the wards of the Edinburgh Royal Infirmary many cases have been treated entirely by second and third year students, with quite satisfactory

results. There seems, therefore, no reason why every medical man should not be able to practise at least Professor Lucas-Championnière's method, either directly, or indirectly through assistants to whom he has given a few lessons. If the treatment be applied first to a Colles's fracture, it can afterwards be extended to others.

The Use of Splints.—When the massage and movement treatment is applied to fractures, splints are used not so much to ensure immobility as (1) To prevent deformity; and, while pain on movement lasts, (2) To give support to the seat of fracture and adjacent parts.

1. *To Prevent Deformity.*—An injurious degree of deformity, although not liable to occur in every case of fracture treated without splints, is still to be feared in two groups of cases: (*a*) In fracture of the shafts of long bones where the skeleton of the limb—either one or two bones—is broken in the middle two-fourths; or (*b*) Near the articular ends of long bones, when the short fragment is considerably displaced by muscles.

a. In the first group are fractures of the shaft of the femur and humerus, or of both bones of the leg or forearm. In these injuries the joints above and below the broken bone may with advantage be supported for the first few days in order to relieve muscular spasm and consequent pain; but after that the joints should be left free, so that the patient may make occasional voluntary movements.

It follows from this view of the function of splints when used along with massage and movement, that so long as deformity is prevented the splints should not constrict the limb and thus hinder circulation, and should not fix the neighbouring joints and thus hinder occasional voluntary movements.

b. In the second group are fractures of the surgical neck of the humerus high up, and fracture of the femur just below the small trochanter or just above the condyles. In cases such as these the fragments which can be controlled must, by the aid of splints, be kept in line with the other fragment which cannot be so controlled. In such cases the splint must fix the joint nearest to the seat of fracture, but it should, with due precaution, be loosened from time to time for massage and movement, beginning as soon as the parts are sufficiently united to make that safe.

2. *To Give Support.*—There are many fractures in which there is little or no fear of deformity should splints not be used, but yet in which the patient suffers great pain and discomfort if the injured part be not adequately supported for the first few days. Colles's fracture is a case in point. If by extension and manipulation the deformity can be reduced, there is not much likelihood of its returning; yet the patient generally welcomes the support of a splint to the wrist and hand for some days at least, and for this purpose a splint is of service.

The Use of Extension.—However valuable massage may be in soothing spasm, and voluntary effort in relaxing it, or however useful splints may be in maintaining a good position, obtained under anæsthesia or otherwise, there are cases in which continuous extension, by weights or elastic cord, is indispensable to obtaining the best possible apposition of the broken ends. These cases are those in which powerful muscles are involved, and in which it is possible to antagonize the displacement by a direct pull. The best example is the displacement of over-riding caused by the muscles of the thigh in an oblique fracture of the femur. The steady, continuous pull of a well-adjusted weight tires out the muscles, and diminishes, if not completely overcomes, the over-riding. The amount of weight employed will correspond with the strength of the muscles to be antagonized, and will vary from two or three pounds in a child to perhaps twenty pounds or more in a strong man. It is seldom necessary, however, to keep up the extension for more than a fortnight, although the splints may be required for much longer. More will be said about extension in connection with the fractures of bones of the lower limb.

The Diagnosis of Fractures.—Although the well-recognized signs and symptoms of fracture—deformity, unnatural mobility, crepitus, want of power, swelling, irregularity palpable in subcutaneous bones—are sufficiently well known to every student of medicine, the relative importance of the various signs and symptoms in the diagnosis of individual fractures is perhaps not sufficiently appreciated.

The surgeon should, if possible, investigate every case of fracture systematically, employing successively his 'ears, eyes, and fingers'. By so doing, he will often spare the patient much pain, and at the same time be able to make a more accurate diagnosis

than by the common method of beginning with the fingers and following or not with the eyes and ears.

History of the Accident.—It is important to obtain as minute details as possible of the way in which the accident has happened. Care should be taken, for instance, to find out if the patient fell because the bone had given way, or if the bone had been broken because the patient fell. If any direct injury or strain were the cause of the fracture, an effort should be made to ascertain as exactly as possible how the force was applied to the bone.

Inspection.—The shape and attitude of the limb will often be pathognomonic. This is especially seen when the shaft of the femur or humerus is broken, or both bones of the forearm or leg. Moreover, very valuable information will often be obtained by asking the patient to cautiously move the affected limb. As the result of such an effort we can sometimes exclude fracture by seeing what the patient can do, as well as confirm the probability of a fracture by seeing what he cannot do.

By *Manipulation and Measurement* the points we can make out are: irregularity of outline (including separation of portions of bone, and change of shape due to impaction); mobility, presence of crepitus, shortening, and the presence of tenderness when the injured spot is pressed upon or moved by pressure at a distance. It is not necessary that we should obtain all the characteristic signs in every case; one sign is often sufficient, and in the discussion of the different fractures, attention will be drawn to the signs which are of most value in each case. Sometimes the swelling and muscular spasm may make the diagnosis difficult. If after diminution of swelling and spasm by massage there is still uncertainty, a general anæsthetic should be given. If the anæsthetic should not enable the surgeon to establish his diagnosis, a Röntgen-ray photograph should be taken. Apart from the use of the *x* rays as a guide to treatment, an *x*-ray photograph is important in all cases where there may be a question of compensation or 'damages'.

General Indications for Immediate Operation :—

1. Where marked angular deformity cannot be remedied under an anæsthetic or prevented from returning under the method of treatment adopted. This is especially important in the lower limb.

2. Where crepitus cannot be elicited under an anæsthetic, although the fragments are movable. This indicates that the broken surfaces are drawn apart by muscular action or are separated by soft parts, and will therefore probably unite by fibrous tissue only.

3. Where, a joint being involved, the movements are likely to be impaired by the presence of bone fragments or by alterations in the relations of the articular surfaces which cannot be otherwise remedied.

4. Where there is an excess of extravasated blood causing great tension in the limb.

5. Where there is evidence of injury to an important nerve or blood-vessel at the seat of fracture.

General Contra-indications for Immediate Operation.—Even in cases which might be otherwise suitable for operation, a surgeon would probably decline to operate :—

1. If the bones were probably brittle from old age or other cause.

2. If the patient's constitution were seriously impaired by disease or alcoholic excess.

3. If septic abrasions of the skin near the fracture were present, for in that case the wound would almost certainly become septic. In the case of compound fractures, the position of the bones may be rectified and maintained sufficiently without plating; or silver wire, which is not irritating, may be used. In some cases the risk of sepsis can be obviated by the use of antiseptic measures. Should they be successful, plating, if required, may be carried out after an interval of three or four days.

Most Suitable Time for Operation when one is deemed necessary.—There is an advantage in waiting for two or three days after the accident. By that time a protective reactionary congestion will have set in at and near the seat of fracture, and shock will have passed off. From the fourth or fifth day onwards, however, replacement of fragments becomes progressively more difficult, owing to the formation and strengthening of adhesions.

Choice of Apparatus.—The changes which are coming over the treatment of fractures are not so much in the direction of new forms of apparatus as in modifications of the apparatus which have been in use for some time. Almost every hospital or school of surgery has its own form of retention apparatus with which good results have been obtained. In the pages which follow, an effort will be made to indicate the forms of

apparatus which seem to be the most applicable to general practice, and the best adapted to the application of massage and movement. Under the heading 'Massage and Movement' we shall follow for the most part the directions given by Professor Lucas-Championnière and his pupil Dr. Dagron.

Delayed Union.—This term is applied to a slow development of bone in the callus, and is due sometimes to deficiency in the general health of the patient, sometimes to want of active circulation at the seat of fracture. It is less likely to be met with under the massage and movement treatment than when the circulation of the parts is interfered with by prolonged fixation in splints. The indication for treatment is to stimulate the circulation at the seat of fracture, and this may be done in several ways. One of the best and simplest is to produce passive congestion by applying round the limb above the fracture an elastic bandage tight enough to retard the venous return and cause some swelling and bluish discoloration of the limb below. Formerly the parts below the fracture were supported with a bandage, but this is not necessary. The bandage may be kept on for about twelve hours out of the twenty-four, preferably at night. This method was introduced by the late Owen Thomas under the title of 'damming' in 1878, but was not much used until it was independently discovered and advocated some years later by Professor Helferich. Another method which Owen Thomas practised with success is described by him as 'hammering'. It may be performed under an anæsthetic, at intervals of about a week, by wrapping the seat of fracture in a towel and beating it with a hammer or mallet; or, without an anæsthetic, by daily percussion for a few minutes as firmly as the patient can bear. 'Hammering' can be best applied to subcutaneous bones, but it may be also applied to those that are clothed with muscle, care being taken not to damage nerves or large blood-vessels. 'Hammering' and 'damming' may be used with advantage together. Forcible rubbing of the ends of the bones against one another, with or without an anæsthetic, may be used independently, or to supplement the 'hammering' or percussion. Professor Bier has obtained very good results in both delayed and non-union by the injection of the patient's own blood at the seat of fracture. By means of a strong 30-c.c. syringe armed with a hollow needle, from 15 to 30 c.c. of blood are withdrawn from a vein in the patient's forearm. The needle is thereafter thrust into the seat of fracture, and the blood is injected between the bones and as far as possible under the periosteum. All necessary precautions are of course taken to render the procedure aseptic. When these measures fail, operative methods will have to be employed.

II.—TREATMENT OF PARTICULAR FRACTURES.

Fractures of the Clavicle.*

The Middle Third is the most common situation. The break is caused occasionally by direct, but more frequently by indirect, violence resulting from a fall on the shoulder or outstretched arm. This form of injury seems to twist the clavicle, the strain acting on the bone through the medium of the conoid and trapezoid ligaments.

The history of this form of injury, with subsequent pain about the clavicle, and inability to use the arm, is important. The attitude of the patient in a recent case is characteristic. The elbow of the affected arm is supported with the other hand, and the patient inclines his head towards the broken bone. If in a suspected case the patient can easily abduct his arm, there will probably be no fracture. Fracture is probable if there be great swelling over the centre of the clavicle, although the patient had fallen on the tip of the shoulder. If swelling be slight, the irregularity of the subcutaneous aspect of the bone may be visible. If the swelling masks the condition of the bone even to the touch, the surgeon should move the outer end either directly or through the medium of the shoulder, while with his other hand he steadies the inner part of the bone. In so doing, he will elicit crepitus or abnormal mobility.

Treatment.—Should it be important to avoid any unsightly irregularity at the seat of fracture, the patient must be kept in bed, lying upon a firm mattress with a pillow between the shoulders, the arm being supported against the side by a bandage or sling.

---

* The views given as to causation are those of the late Professor Bennett, of Dublin.

In this position the trapezius is relaxed, and the weight of the arm brings the broken ends into apposition. None of the appliances which have been devised to prevent the overriding of the broken ends during ambulant treatment have succeeded in their object. They have all given results good as regards function, but imperfect as regards apposition. The results are no better than those which have been obtained without apparatus. These remarks apply to forms of apparatus in which an axillary pad is used to keep out the arm, to the Sayre plaster method and its modifications, in which the upper part of the humerus is erroneously supposed to be so firmly fixed that it can be used as a fulcrum to lever the shoulder backwards, and to the more or less complicated bandage methods. In a recent case the pain will be soothed by hot fomentations and by massage. The weight of the arm should be supported by a sling tied over the opposite shoulder. Where there is much pain, in addition to the sling, rest in bed or a broad bandage holding the arm against the side for a few days will be indicated.

Massage and movement should be employed daily for the first week, every second day for another week, and at longer intervals for the third week. The sittings should take about twenty minutes at first; afterwards a little longer. Massage the muscles acting upon the broken bone, i.e., trapezius, sternomastoid, pectoralis major, and deltoid; also the soft parts near the bone, and the bone itself, to soothe it. Passive movement of fingers, wrist, elbow, and—gently—of shoulder at the beginning of the earlier sittings. On the second day and onwards allow active movement. At first this should be limited, as regards the shoulder, to a gentle swinging movement, and to gentle movements of the other joints. About the fifth day active movements of the shoulder may be permitted in all directions.

The sling which supports the arm should be worn under the shirt for the first week, after that over the clothes. It will probably not be required after three weeks.

The Outer End.—

a. Beyond the Conoid and Trapezoid Ligaments.—Caused by a blow upon the back of the shoulder, due to a fall or otherwise. Diagnosis is established from the history, pain on movement, and crepitus.

Treatment.—There is no downward displacement, but the shoulder tends to rotate forwards; hence the figure-of-eight bandage should be applied to keep the shoulder back where appearance is of importance. Use massage, movement, and a sling as for fracture of the middle third, except that there will be less massage and more movement.

b. Between the Conoid and Trapezoid Ligaments.—Caused by a downward blow upon the outer end of the clavicle. The clavicle is thought thereby to be broken across the coracoid process. Diagnosis as in (*a*).

Treatment.—There is no tendency to displacement; treat as for fracture of the middle third.

The Inner Third.—Caused by force applied along the line of the bone. Diagnosis is based upon the history, pain on movement, swelling of the soft parts, irregularity of the orifice, and crepitus.

Treatment as for fracture of the middle third.

Fractures of the Scapula.

These are caused by severe crushing of the thorax, and are generally accompanied by fractures of the ribs. There are dyspnœa and much pain on account of the large muscles which are involved and which are thrown into spasm at first. Diagnosed by the history of the injury, spasm of the muscles of the shoulder, irregularity of the subcutaneous parts of the bone, and crepitus on movement.

Treatment.—Massage the swelling and the muscles of the shoulder and upper part of thorax. In the interval, support the scapula by a bandage round the chest, and steady the arm with a sling. Fractured ribs are no contra-indication to massage. Adhesive plaster, if applied to the chest on account of the broken ribs, will support the scapula also, and massage can be carried out over the plaster. Massage should be daily at first, and at longer intervals afterwards. Passive movements of the shoulder while the scapula is steadied should be begun as soon as spasm has passed off. Active movements of the fingers and elbow should be encouraged early, and of the shoulder as soon as the patient can perform them without pain.

Fracture of the Acromion Process.—Caused by direct violence, a blow, or a fall upon the shoulder. Diagnosed by the history of the injury, drooping of the arm and shoulder, and inability to use the deltoid; local tenderness and crepitus.

Treatment.—The elbow should be supported as follows with an elastic webbing bandage three or four inches in width. Prepare pads of wool for the outer third of the clavicle and point of the elbow of the injured side and for the axilla of the opposite side. Now while an assistant raises the elbow of the injured side and holds the pads in position, the surgeon makes a series of figure-of-eight turns with the elastic bandage. Beginning at the opposite axilla he crosses the shoulder-pad, runs down under the elbow, up to cross the shoulder-pad again, and thence goes back to the axilla. A light strain on the elastic is sufficient. Massage can be employed to some extent without disturbing the bandage, but the latter can easily be removed and replaced every few days for movement, and it may be dispensed with in two or three weeks. Besides the elastic support, a bandage or sling to steady the arm is advisable at first, and massage and movement as for fracture of the main bone.

Fracture of the Coracoid Process is very rare, and is due to direct violence. The diagnosis is difficult. It may be suspected owing to pain on movement which involves the coraco-brachialis and biceps muscles, and may sometimes be established by crepitus and pressure over the coracoid process. An *x*-ray photograph is advisable in this and all other injuries about the shoulder where the diagnosis is doubtful.

Treatment as for fracture of the acromion process.

Fracture through the Neck of the Bone.—This is a very rare condition, and is caused by direct injury. It is important, because the symptoms resemble those of downward dislocation of the humerus, with the difference that the flattening of the shoulder and lengthening of the arm can be overcome by gently drawing the arm away from the side and then lifting the whole arm upwards. Crepitus will be felt as the parts return into position.

Treatment as for fracture of the acromion process.

Fractures of the Humerus.

Fractures at the Upper End.—*General Remarks.*—After a severe injury to the shoulder, the exact diagnosis may be a matter of great difficulty. Besides fracture or dislocation of the upper end of the humerus, or both, there may be present fracture or dislocation of the outer end of the clavicle, or fracture of the acromion process.

A history of the accident must be obtained if possible. Then the various methods of procedure already mentioned should be carefully followed out. If, after the muscles have been soothed by massage, the diagnosis is uncertain, it is better to give a general anæsthetic. By the relaxation of muscles thus produced, and by the more free handling which is then made possible, the diagnosis may be established, and at the same time the treatment may be begun by the reduction of a dislocation or the setting of a fracture as the case may be. If, as may sometimes happen, a diagnosis should not be possible under a general anæsthetic, two courses are open: to have an *x*-ray photograph taken, or to reduce the swelling rapidly by massage and to repeat the effort at diagnosis in a day or two; or perhaps to employ both methods.

Malposition or adhesions are the two main reasons why, after fracture of the upper end of the humerus, the patient may never regain a proper functional use of the shoulder. (1) The upper fragment is in some cases markedly tilted upwards and outwards (abduction) by the action of the supraspinatus muscle; this occurs in separation of the upper epiphysis, and in high transverse fractures of the surgical neck. It will be evident that if union takes place with the upper fragment definitely abducted and the lower fragment in the position of adduction against the side of the body, abduction of the arm as a whole will afterwards be impossible at the shoulder-joint. There are two possible ways of obviating this form of vicious union: an operation may be performed, and the ends of the bone brought together and held there by plates, wires, or pins; or, if under an anæsthetic the lower fragment can be brought up to the upper one, the broken limb may be treated in the abducted position. (2) The shoulder-joint and the surrounding muscles may be matted by adhesions. This is apt to occur in all fractures at the upper end of the humerus as the result of prolonged immobilization, and is the commoner cause of

functional disability. Fortunately it is also the cause more easily obviated, as adhesions are prevented by the employment of massage and movement. Where the muscles can be kept functionally active and the joint free from adhesions by this treatment, good functional results will be obtained, even although there may be considerable over-riding of the broken ends, or even if some angular deformity persists. In the latter case, increased mobility of the scapula will compensate for the restricted movements at the shoulder.

The injury may be (*a*) *Of the Anatomical Neck*; (*b*) *Of the Greater Tuberosity*; (*c*) *Of the Surgical Neck*; (*d*) *Separation of the Epiphysis.*

a. Fracture of the Anatomical Neck.—This is usually caused by direct violence, as in a fall upon the shoulder, and is often accompanied by comminution of the tuberosities. Should the upper fragment be separated from the rest of the bone, non-union is likely to occur and operation will be therefore indicated; but if there be impaction, union will probably take place.

Treatment.—Massage should be begun at once (see general instructions), and should be continued daily for about a month. Passive movement of the shoulder should also be employed from the first, very cautiously of course to begin with, and gradually increased. Active movements of the shoulder may begin about the fourth day; at first only slight movements of abduction, then movements forwards and backwards, and last of all movements of rotation.

The only apparatus required is a simple sling to support the forearm, the hand being left free so that active movements of the wrist and fingers may be made from the first. For the first day or two, if there is much pain, the patient will be easier in bed with the arm bound to the side. After the pain and spasm have subsided, he can go about with the sling beneath the clothes until after the fourth day; the sling may then be worn outside the clothes. All movements are to be controlled by pain and fatigue. Union is generally complete in a month, but treatment should be kept up until the movements are quite free.

Where there are simultaneous fracture of the neck and dislocation of the head, a serious operation will probably be required.

b. Fracture of the Greater Tuberosity.—This may sometimes be recognized by the presence of crepitus and of increased breadth of the shoulder, while by a finger in the axilla the head of the bone can be felt to move with the lower end of the shaft. In doubtful cases an *x*-ray photograph should be taken.

The Treatment is much the same as for fracture of the anatomical neck, with this difference, that the massage must chiefly be applied to the supra- and infraspinatus and teres minor muscles at first, that movements of rotation must be carefully watched, and that at first the joint must be kept from the formation of adhesions chiefly by swinging movements, others being added by degrees. A sling is needed as for the fracture of the anatomical neck. An operation may sometimes be necessary should the separation of the fragments be considerable.

c. Fracture of the Surgical Neck.—This is caused most frequently by a fall upon the shoulder; sometimes by a fall upon the hand or elbow. The diagnosis is based upon the tilting outwards of the lower end of the humerus, the head of the bone being in position, and increased mobility with crepitus at the upper end of the bone. A general anæsthetic may be necessary to establish the diagnosis and allow the fracture to be set, should massage fail to ensure the necessary relaxation of spasm.

Treatment.—The upper fragment cannot be controlled by splints. Still in most cases the treatment which answers best is that recommended for fracture of the anatomical neck. Should the upper fragment be much tilted outwards, the lower fragment must if possible be brought to it by being placed in the position of abduction. Middeldorpf's abduction splint in the form of a triangle can easily be made of wood, perforated zinc, or tin. The base of the triangle rests against the patient's trunk, while the other sides of the triangle support the upper and forearms respectively. Should the abducted position fail to keep the ends in fair apposition, the question of operation must be considered.

The abduction splint may have to be employed for two or three weeks; but during that time the shoulder should be massaged every few days, and movements of the elbow and fingers encouraged. On the removal of the splint, a cushion should be employed as in the next case. This in turn should be dispensed with as soon as possible, probably in a week or two.

In cases where the upper end is not much tilted outwards, but in which the lower fragment is drawn inwards by the muscles inserted into the bicipital groove, the broken ends can be kept in position by laying the arm upon a wedge-shaped cushion which has its apex in the axilla. This cushion may be conveniently formed of a piece of cardboard bent upon itself, filled up with cotton-wool, and padded on the outside. The arm is then laid upon this cushion and bandaged to the side. After four or five days the bandages are loosened, the parts massaged and gently moved, and the arm again fixed up as before. This massage and movement are repeated in a few days, and generally at the end of about ten or twelve days the cushion can be dispensed with and only a sling employed.

d. Separation of the Upper Epiphysis.—This injury occurs in persons under 20 years of age, usually from direct, but sometimes from indirect, violence; in fact it is often the result of an injury which would have caused a dislocation of the shoulder in an older person.

The symptoms resemble those of subcoracoid dislocation as regards the axis of the humerus and the presence of a prominence under the coracoid process. If the swelling is not too great, however, the head of the bone may be recognized in the glenoid cavity.

Treatment.—Under a general anæsthetic an effort should be made to restore the separated parts. The head of the bone is steadied with the fingers of one hand, while the arm is drawn away from the body and gradually abducted to its extreme limit. When the displacement is reduced, the limb is fixed in the abducted position. An abduction splint is then necessary. A convenient form to use is a small-sized Thomas's knee bed-splint or a special splint of the same pattern made of light iron or of strong galvanized wire. The patient is put to bed and, while the arm is held at right angles to the body, the ring is carried over it and passed up to the axilla. Extension straps acting from the wrist and forearm are then fixed to the end of the splint. Should abduction beyond a right angle be necessary, the arm may be fixed in the desired position by plaster-of-Paris bandages passing from the thorax to the arm. After seven to fourteen days the plaster may be removed for massage and cautious movement, and a Thomas type of splint applied. This permits of a course of massage and movement like that prescribed for fracture of the anatomical neck, only begun at a later date. When abduction at an angle less than a right angle is indicated, a Middeldorpf splint may be used. If the separated portions of bone cannot be brought into line, an operation will be indicated.

Fractures of the Shaft.—These are caused usually by direct violence, but sometimes by a fall upon the hand or wrist, or by a twist.

Diagnosis is generally easy on account of the deformity and increased mobility; non-union is common, but this does not seem to be due, as was formerly supposed, to movement of the fracture during the course of treatment, but to interposition of soft parts, or to the imperfect blood-supply of the lower fragment owing to tearing of the nutrient artery.

Treatment.—It will be necessary to make sure that the musculospiral nerve has not been torn at the time of fracture, or nipped between the fragments when the bones were being set. If the nerve has been torn, the ends must be sutured at once by operation. After massage, the ends of the bone can generally be brought into apposition. Although some cases can be treated with a sling only, without splints, combined with massage and movement, it will generally be advisable to encircle the limb with well-padded supporting splints, one at the outer and back part of the arm with an excavation over the outer condyle, and another shorter splint for the front and inner side. These may be made of Gooch's splint, poroplastic felt, or pasteboard. They must be well padded, and fixed tight enough to prevent angular deformity, but not to interfere with the circulation of the limb. The arm should be kept in a sling. The fingers and wrist should be moved voluntarily from time to time by the patient, and passive movement of the elbow and shoulder should be made at the massage sittings every few days. At first the support of the splints should be maintained during the passive movements. The splints may be required for about three weeks. Union generally takes place in about four weeks.

If signs of involvement of the musculospiral nerve should appear during the formation of callus, time should be given for the callus to consolidate and contract. If the nerve seems to be permanently involved, an operation to free it will be necessary. Massage should not be applied to the seat of fracture in such a case, as the callus will be thereby increased.

Delayed Union.—Should union be delayed, the activity of the healing process may be hastened by the measures already indicated for that condition (*vide supra*).

Fractures near and into the Elbow-joint.—(*a*) Transverse fracture at the olecranon and coronoid fossæ ; (*b*) T-shaped fracture ; (*c*) Separation of the epiphysis ; (*d*) Fracture of either condyle ; (*e*) Fracture of either epicondyle.

These fractures are often very complicated and difficult to diagnose. The swelling is often great, and one or more of the fragments may be very small. After the history has been obtained and the aspect of the limb and possible voluntary movements have been observed, the following method of examination will be found useful, even when the swelling is great. Begin by massaging above the elbow, and try to reduce the swelling round the joint as much as possible ; then follow with the fingers the subcutaneous ridge of the ulna from the forearm to the olecranon process, and see whether or not the olecranon is transversely movable. Then compare the relations of the condyles with the olecranon on the two sides of the body. Grasp the lower end of the humerus by the condyles, and see if it is continuous with the shaft or nor by making a movement in the transverse direction. Take each condyle separately between the finger and thumb, and try to move it antero-posteriorly. The bony points, although obscured by the swelling, can generally be made out by steady pressure over the place where they should be. In children, a transverse fracture through the olecranon fossa often occurs, even though the epiphysis has not united. A general anæsthetic and *x*-ray photograph should be employed where there is any doubt as to the diagnosis.

Treatment.—If displacement be slight or absent, keep the arm in a sling, and treat by massage and movements only. If displacement be well marked, reduce (under an anæsthetic if necessary), and bandage the arm into a rectangular posterior gutter-splint of metal, poroplastic felt, or plaster. If displacement be very great, reduce as before, but fix the elbow in acute flexion. Many surgeons prefer acute flexion in all cases. A small pad is placed in the bend of the elbow, and a figure-of-eight bandage put round the joint. Operation will be necessary if the symptoms point to the involvement of the ulnar nerve, or if the fragments cannot be properly moulded into position and retained there.

Massage and movement are of especial value in all fractures into the elbow-joint. Unless there is great tendency to displacement of the fragments, this treatment should be carried out daily at first. In addition to the general indications already given, the following points should be attended to. While the effusion should be dispersed as soon as possible, care must be taken not to stimulate the formation of callus by massaging the seat of fracture itself, especially in young children. The broken bone must be steadied during massage, and especially during active and passive movements. The masseur must make sure that any movement that takes place does so at the joint and not at the seat of fracture. The amount of movement must be regulated by the pain. Where pain restricts movement, there will be no gain in forcing the movement, which only calls forth contraction of the antagonistic muscles.

Where displacement tends to recur, the splints may be left undisturbed for two or three days. After about a week, the tendency to displacement will be very slight. On the other hand, if displaced fragments have not been replaced for ten to fourteen days, it will be difficult to rectify the position, even under an anæsthetic. Improvement in range of movements sometimes goes on for many months after the fracture has united, the patient's own voluntary efforts being of much assistance.

Fracture of the Olecranon.

This injury is generally caused by direct violence, sometimes by the action of the triceps. Diagnosis is generally easy by manipulation (see method of examining for fractures of the lower end of the humerus). The patient's power of extension should be tested when the forearm is allowed to hang vertically from the abducted upper arm, i.e., in extension against gravity.

Treatment.—Formerly an apparatus was applied to keep the elbow extended and to draw down the upper fragment of the olecranon. This method, however, Lucas-Championnière found quite unnecessary if the massage and movement treatment is carried out. The only appliance required is a sling, in which the arm rests at first at an angle of 135°, i.e., midway between full extension and a right-angled position, while round the

elbow a bandage may be lightly applied, partly to support the parts and partly to meet the patient's desire to have some form of apparatus.

For the first day or two the patient may be more comfortable in bed with the arm lying on a pillow in a semi-extended position. In a day or two he will be able to get up and go about with the arm in a sling. The massage should be carried out with the limb in the most comfortable position, which is generally that of slight flexion, the limb lying on a cushion. After the use of the stroking movements already described for soothing the muscles, gentle passive movements may be made, and so long as they do not excite muscular spasm they will not lead to separation of the detached fragments. The massage sittings are repeated daily, but for several days passive movement only is allowed at the elbow ; gentle active as well as passive movements of the wrist and fingers are encouraged.

As the tenderness subsides, the massage is applied more deeply round the elbow-joint, and the range of movement is extended. It should be remembered that active flexion and passive extension movements are least likely to do harm. Usually complete flexion is possible in about three weeks, but full extension is often delayed ; sometimes it is never quite regained. For many weeks after the movements of the joint are free the patient must abstain from any violent muscular exercise, especially such as will bring the triceps into strong action, lest the uniting callus should be stretched or torn.

Professor Lucas-Championnière found that operation was not required in fracture of the olecranon treated by his method, and this experience has been amply confirmed by others who have adopted the method.

Fracture of the Bones of the Forearm.

Fracture of Ulna and Radius is caused most frequently by direct injury. Diagnosis is easy owing to the deformity and increased mobility.

Treatment.—The fracture, if below the middle of the arm, must be set after relaxation of the muscles by massage or by a general anæsthetic. During reduction the forearm should be held supine. Splints must be employed to prevent recurrence of deformity. They must be broader than the forearm, and rigid, so that the broken ends of the radius and ulna are not pressed together. Union of the bones to one another would prevent pronation and supination. The most convenient material is Gooch's splinting, applied with the wood towards the limb, and the leather outside. The posterior splint should extend from the olecranon, and the anterior splint from the bend of the elbow, to the wrist. This will allow free movement of the fingers and slight movement of the wrist.

After the first soothing massage the splints may be left undisturbed for four or five days. They will then be taken down and the limb massaged, while the bones are steadied by an assistant. Slight movements of the elbow are possible with the splints in position, and hence do not need to be carried out at the massage sitting. Pronation and supination must be passive only at first, but even these must be delayed until all muscular spasm has subsided and the parts are beginning to solidify. While the patient is going about, the limb is laid in a sling in the supine position as much as possible.

Fracture of Ulna alone, also Fracture of Radius, below the Insertion of Pronator Teres, are to be treated as for fracture of both bones.

Fracture of Radius above Insertion of the Pronator Radii Teres, i.e., in the upper half of the bone, with or without simultaneous fracture of the ulna, is caused by direct violence. The importance of this fracture is that the upper fragment of the radius carries both supinator muscles—biceps and supinator brevis—while the lower fragment has both pronators. The upper fragment rotates on its own axis, and cannot be prevented from remaining in supination. The lower fragment can, however, be controlled. Hence it is necessary to maintain the forearm in the position of full supination and flexion for two or three weeks, the massage and movement being carried out as if both bones were broken below the middle. The position of full supination cannot be voluntarily maintained by the patient without mechanical aid. Besides lateral splints, therefore, as for fracture of both bones, an additional splint is necessary to keep up supination. An angular elbow splint bandaged to the forearm splints will serve the purpose, or a straight piece of Gooch's splint about three inches broad, laid across the angle formed by the upper arm and the forearm splints, and fixed there with a firm bandage.

Fracture at the Lower End of the Radius (Colles's Fracture).—So much has been written about this, the commonest fracture in the body, that there is no need to do more than dwell on the points which seem to be of most importance in regard to treatment.

Two unfortunate possible sequences of this accident have to be obviated as much as possible by the treatment. One is a deformity, which results if the fracture be not reduced. The other, and more important, is stiffness of the wrist and fingers which results from immobilization. There is no necessary connection between these two. Many unrecognized cases of Colles's fracture have left a perfectly good functional result along with great deformity, because the patient has kept on using the wrist, although no attempt had been made to reduce the deformity. On the other hand, cases of Colles's fracture with slight deformity have often become stiff because of prolonged immobility.

Treatment.—As soon as the fracture has been recognized, the displacement should be reduced. A few minutes' massage of the arm, above the fracture, is of service as a preliminary. An anæsthetic is generally necessary. The obstacle to reduction, however, being osseous rather than muscular, gas and ether, or ethyl chloride, may be employed. Sir Robert Jones describes his method of reduction as follows: "To reduce a left Colles's fracture, the surgeon takes the patient's arm in his left hand, with his own scaphoid tubercle against the projecting lower end of the shaft; he then places his right hand on the dorsum of the patient's wrist, with his own scaphoid on the projecting lower fragment. A firm grip with a slight traction and twist of the wrist completely reduces the deformity. If requires knack rather than strength". Another way to reduce is to grasp the hand firmly, and begin by over-extending the wrist, which should be steadied by an assistant; then try to separate the fragments, while keeping up this position. Next, the surgeon, while maintaining the strain, gradually and strongly flexes the wrist and simultaneously forces forward the lower fragments with the thumb of the disengaged hand. It may be necessary to repeat this manœuvre once or twice before the osseous deformity is rectified or materially improved. Some deformity will remain, due to effusion in the soft parts, but will gradually disappear.

After reduction, the limb should again be massaged, and then the question of apparatus has to be considered. Deformity does not easily recur after reduction; hence some surgeons recommend that no splints be employed at all. There are, however, two reasons why a simple splint may often be advisable. If there is muscular spasm, a certain amount of deformity may be reproduced by the action of the muscles; while the tenderness of the wrist often makes it very painful for the patient to steady his wrist if it is allowed free play. In severe cases it is therefore better to lay the hand and forearm on a well-padded anterior splint reaching to the palm. To this the hand and forearm should be lightly bandaged, either with or without the additional support of a dorsal splint. Massage of the forearm and wrist should be performed, daily at first, on the general principles already laid down. After the first week the sittings may be less frequent.

Passive movements should at first be confined to the fingers. As the pain becomes less, the movements may extend to the wrist. Pain should be taken as the guide to the extent of the movements. Active movements of the fingers generally begin about the third day, and should be followed by slight active movements of the wrist as soon as the pain permits. Pronation and supination come last of all.

In cases where the displacement is slight and the pain not great, after reduction the wrist should be supported with a strip of plaster or a bandage, and the forearm laid in a sling with the hand hanging over the edge.

Injuries of the Carpal Bones.

The two most common injuries of the carpal bones are fracture of the scaphoid, and anterior dislocation of the semilunar bone, either separately or combined.

The cause is usually a severe twist or strain, such as might have produced a sprain.

Simple Fracture of the Scaphoid Bone.—Diagnosed even without the x rays, from "(*a*) History of a fall on the extended hand; (*b*) Localized swelling in the radial half of the wrist-joint; (*c*) Acute tenderness in the anatomical snuff-box when the hand is abducted; (*d*) Limitation of extension by muscular spasm, the overcoming of which by force causes unbearable pain" (Codman and Chase).

Treatment.—Rest of hand on an anterior splint for three or four weeks, with

massage and gentle movement. If there is no union in that time, none probably will take place at all, and the wrist may remain permanently impaired in function. In that case operation is indicated to remove the proximal portion of the broken bone. (*See* Codman and Chase, *Annals of Surgery*, vol. 41, for details of the operation, and for the diagnosis and treatment of dislocation of the semilunar bone.)

Fracture of a Metacarpal Bone.

The commonest fracture of a metacarpal bone is that of the base of the metacarpal bone of the thumb—'Bennett's fracture'. It is caused by a blow in the long axis of the thumb (on the point), whereby the anterior portion of the surface which articulates with the trapezium is split off. A partial dislocation backwards results.

Treatment.—Extension; replace the metacarpal bone, and prevent it from passing backwards again by the pressure of a firm pad held in position with a splint which reaches from the lower end of the radius to the end of the thumb. Several forms of splint have been recommended. The most useful is a piece of Gooch's splinting, a little wider than the thumb and of the requisite length.

Massage for a few days should be carried out, also passive and active movements, while the proximal end of the bone is steadied by the grasp of a finger and thumb. Bennett advised the use of a splint for four weeks, but with massage and movement this time may be considerably diminished.

Fractures of one of the four Inner Metacarpal Bones.—This may be caused by direct violence. An important point in diagnosis is the shortening. The patient should be made to close both hands, and the level of the heads of the metacarpal bones should be compared on the two sides. In doubtful cases crepitus or abnormal mobility in the suspected bone may be looked for.

Treatment.—Bandage the forearm and hand to an anterior splint, with a good pad for the palm, or bandage the closed fist with a pad in the palm, and support the forearm in a sling. Massage the hand and forearm, at first daily; after the first week, at intervals of a few days. Passive movements of the fingers should be employed from the first. In a few days encourage active movements. Union takes place in about three weeks.

Fractures of the Ribs.

Treated by the usual methods of strapping and firm bandage.

Fractures of the Pelvis.

The general principles which have been laid down for the treatment of fractures elsewhere should be applied to the pelvis—i.e., massage to the neighbourhood of the fracture, gentle passive movements to prevent stiffness of the hip-joint, and active movements cautiously increased.

The patient should be in bed for from six to eight weeks; a bandage round the pelvis will be found a comfort for the first two or three weeks.

Fractures of the Bones of the Lower Limb.

Fractures of the Femur.—During the progress of the war, great improvements in the results obtained in gunshot fractures of the femur were brought about by certain changes gradually introduced in the methods of treatment; the following are the more important: (1) The 'bed' type of Thomas knee-splint was adopted as the standard Army appliance instead of the Liston long splint. (2) The Thomas splint was applied as soon as possible—generally at the casualty clearing station—and was maintained during transport and in subsequent hospital treatment till the patient was convalescent. (3) A hinged leg-piece with foot-support was attached to the main splint, so that the knee might be flexed or extended without disturbing the seat of fracture. (4) The joints of the foot and ankle were massaged and gently moved as a routine, and the muscles of the lower limb were massaged when sepsis permitted. (5) The wounds associated with the fractures were treated by early excision and by several improved methods of preventing and overcoming sepsis. (6) Orderlies were specially trained to handle fractured femurs on the field and subsequently; and the patients were assembled in special femur hospitals, where the beds were altered to suit the nursing of these cases.

Most, if not all, of the methods found serviceable in war time are applicable to cases in civil practice, although severe compound fractures preponderate in war time, and simple fractures in time of peace.

a. **Fractures of the Neck.**—A good deal of the difficulty in diagnosing the intra- from the extra-capsular fractures may be traced to an imperfect understanding of what it is that really makes the difference between the two forms of fracture. The mechanism which causes the fracture is different in each case. The *intracapsular* fracture in a very large majority of cases is caused by a twist or strain which acts transversely or obliquely to the long axis of the neck. The bone is not likely to give way from this form of injury unless it has been previously weakened by disease or senile atrophy. Hence its association with old age almost exclusively. The *extracapsular* fracture results from violence applied to the great trochanter—almost without exception from a fall upon it—and which therefore acts more or less directly along the axis of the neck. Aged and fragile persons, just as much as those who are younger, will suffer from this form of fracture, and not from the intracapsular form, if they happen to fall heavily upon the great trochanter. The *intracapsular* fracture is a mere transverse break of the neck of the bone ; it is seldom impacted, but when this does occur, the lower fragment—neck—is driven into the upper—head. In these cases there has probably been a bruise from a fall following a break from a strain. The *extracapsular* fracture is really a break between the neck and the great trochanter. It is always impacted—at first, at least—and, as the result of this impaction, in severe cases the trochanter is split up into several fragments.

The history of the nature of the accident is therefore of great importance in diagnosis. In extracapsular fracture, the history of a fall upon the trochanter, and the presence of anteroposterior thickening when it is grasped between the finger and the thumb, are generally sufficient to establish the diagnosis. *Raising of the trochanter* accompanies either form, although in the intracapsular form, until the capsular ligament softens, the raising may be very slight. *Crepitus* should not be looked for, lest impaction should be undone in the one case, or some reflected portions of the capsule which carried blood-vessels should be torn in the other. *Eversion* occurs in both forms of fracture, as well as in a mere bruise of the hip.

In intracapsular fracture there will be the history of a twist or jerk of the neck of the bone, often the sound of something giving way ; then sudden inability to use the limb, and the patient falls to the ground. The diagnosis is often best arrived at by exclusion.

Extracapsular Fracture.—This is much the commoner form of the two. Bony union with eversion and some shortening takes place almost invariably ; but the patient is crippled, not from this, but from the ankylosis of the hip-joint which results from the period of immobilization which is usually enforced.

In the comparatively rare cases in which the fracture occurs in men who are still able for active work, much benefit results from undoing the impaction (if considerable) under an anæsthetic. The limb, having been wrenched into the abducted position, is kept there. Massage is applied to joint and muscles, and gentle passive movement begun in about fourteen days.

Lucas-Championnière trusts to early movement in these cases more than to massage. He fears that massage over the large veins in old people might set free a clot, and so he confines the massage chiefly to the posterior aspect of the hip. If there is much muscular spasm, and especially if the impaction has become lessened, extension of the limb with weight and pulley is advisable, but it need not be continued for more than ten to fourteen days. No splint should be used, only sand-bags to steady the limb. Massage of the posterior and outer aspects of the hip may be employed daily or every few days. After a period varying from five to fifteen days, the patient should get out of bed and should move about a little on crutches with an assistant on each side, at first at least. The sound foot should be raised with a high heel. Gentle swinging movements of the thigh should be encouraged, the range being increased as strength returns. Active movements of the foot, ankle, and knee should be made after the first day or two. The patient cannot bear weight upon the injured limb until eight to ten weeks have elapsed.

Intracapsular Fracture.—Professor Lucas-Championnière does not discriminate this from the extracapsular form in his account of the treatment. In view of the progressive shortening which takes place after the capsular ligament has given way, extension with

weight and pulley is advisable for three or four weeks, if the patient's health permits recumbency for so long. A Thomas hip-splint should be worn in bed for about the same time, and the limb should be steadied with sand-bags. Massage as indicated already for the extracapsular form of fracture should be applied for a few days at least. The patient may be raised in bed almost from the first, although the bed will be tilted up at the foot in order to provide counter-extension. The stages in the progress should be similar to those of the extracapsular form, but from two to four weeks later.

If there is no union at the end of ten or twelve weeks, the patient must depend on bearing his weight upon ligaments, which will grow stronger as time elapses. A firm belt round the pelvis, extending below the trochanters, will be helpful.

b. **Fracture just below the Lesser Trochanter.**—This generally occurs in old people as the result of a twist, and the line of fracture is often oblique. Fortunately the injury is a rare one, for it is probably without exception the most difficult fracture in the body to treat satisfactorily. The upper fragment, short and sharp-pointed, is forced forward by the powerful iliopsoas muscle, while the lower fragment is drawn up behind it by the hamstrings and adductors. An immediate operation to wire the ends together would be the best treatment if the circumstances permitted.

As regards apparatus the problem is a very difficult one. The upper fragment is so short and so powerfully flexed and everted that it cannot be controlled by any splint. The lower fragment is pulled upwards by the hamstring and inwards by the adductor muscles. The question is how to bring the heavy lower limb, displaced by gravity and by the powerful thigh muscles, acting at first in spasm, into such a position that the broken surfaces are retained in close contact. A double inclined plane may be used, with upward and outward traction on the thigh by weight and pulley. The outward pull, to be efficient, involves fixation of the pelvis, otherwise the patient by swinging round neutralizes the effect. Possibly Dennis Crile's abduction splint recently introduced may be found of service.

c. **Fracture of the Middle Third** is caused both by direct and indirect violence. Diagnosis is generally easy from the distortion and unnatural mobility. The patient is not able to lift his leg on account of the pain thus produced, which is due to distortion at the seat of fracture.

Treatment.—The objects to be aimed at in the treatment of this as of other fractures are several, i.e., the union of the broken ends without overlapping—and especially without angling—the prevention of adhesions among the thigh muscles and of their involvement in the callus, and the maintenance of nutrition in all the muscles and of mobility in all the joints of the limb. Owing to the bulk and strength of the muscles involved, and to the importance of obtaining a good result, the treatment of this fracture requires special description, under the heads of extension, splints, massage and movement, and the bed.

Extension.—The best method is that applied directly to the condyles of the femur, by Steinmann's pins, or by Besley's, Hey Groves', or some other form of 'caliper' gripper. Its advantages are that the extension is more certain and is obtained with less weight than by the adhesive-plaster method, and that it admits of flexion and free movement of the knee. Moreover, there is no hindrance to massage of the calf muscles as there is by the older method. Its disadvantages are the risks of sepsis and of slipping of the gripping appliance. Hence it should not be adopted unless careful supervision and strict antiseptic precautions can be ensured.

The indirect method of extension through bands fastened to the skin was improved during the war by the introduction of Sinclair's glue (water and ordinary glue, of each 50 parts ; glycerin and calcium chloride, of each 2 parts ; thymol, 1 part), to replace adhesive plaster. The unshaven skin is first washed with soap and a solution of carbonate of soda (4 drachms to the pint). When dried it receives a coating of the melted glue, and upon this are laid 4-in.-wide strips of 4-ply gauze, which extend from the lower part of the thigh to about two inches above the malleoli. Padding is placed at the head of the fibula and above the malleoli, and the whole is covered with a light bandage. Extension can be applied 'almost immediately'.

Although this method does not admit of the flexed position of the knee during treatment, it does not preclude either passive movements of that joint or massage of the calf-muscles through the bandage. There is a difference of opinion whether extension

should be 'continuous', i.e., as by weight and pulley, or 'fixed', i.e., by a firmly-tied bandage, or tape, which is readjusted from time to time. Both views are supported by good authority, and each may well have an appropriate place. The fixed method is alone available for transport, and may, as is claimed, give more relief than the continuous method from the muscular spasms which are so painful for the first day or two after fracture. On the other hand, the continuous method seems to overcome shortening better in old-standing cases, and may also be the more useful in the recent cases after spasm has passed off. It is seldom necessary to maintain extension for longer than about three weeks. By that time the muscular strain is much less, and the broken ends of bone have become adherent.

Splints.—The broken shaft of the bone must be supported by local splints, and for these the most convenient material is Gooch splinting. It should take the form of two or more pieces shaped so as to surround the limb. These are well padded and secured by loops of bandage. Care must be taken to maintain the normal alinement of the femur. The chief risk is a sagging backwards of the broken ends by gravity.

Some cases can be treated by local splints alone, the limb being steadied by sandbags; but most surgeons employ an additional splint to steady the limb, and especially to facilitate nursing. The experience of the war has given the first place to the Thomas bed knee-splint with a hinged leg and foot-piece attachment. Many other splints, such as Hodgen's suspension splint and Hey Groves' wire cradle splint, have also done good service. The old Liston long splint is seldom used now, but it may sometimes be required in an emergency, especially for a restless patient. If used, care must be taken to arrange the padding so that the splint does not cause an inward angle at the seat of fracture.

The Thomas bed knee-splint is now so well known that only a few notes about special points are required. Originally the ring and length of bars were made to suit each patient. When, however, large numbers of wounded men had to be dealt with in France, the splints were made with rings large enough and bars long enough for any case. It was then found that the very wide rings were apt to slip out of place. The ring, during adjustment, was placed against the tuber ischii to maintain counter-extension. Before long, however, owing to any slight movement it slipped upwards till it was arrested at the pubic arch, and this change gave pain to the patient while it slackened the extension. The difficulty was met by slinging up the ring to some point above the patient. When a stretcher was used, a rectangular iron frame ('stretcher suspension-bar') was supplied to fasten on to the stretcher poles with a spring catch, and upon the horizontal bar of this the ring was slung. For hospital cases a correspondingly wider frame was made to suit the bed. As this method obviates the need for keeping many different sizes of splint in stock, it will probably be adopted in civil hospitals. When direct extension is applied to the condyles of the femur, the Thomas splint is raised at the foot to an angle of about 45°, being either suspended from above or supported from below; the hinged attachment is then screwed on to the bars of the splint, and the patient's leg and foot are secured to it. Mobility of the knee-joint is ensured by cautious passive movements begun a day or two after the injury, aided by massage of the muscles. The joints of the foot and the muscles acting on them are treated in the same way.

If weight-and-pulley extension be employed, the foot of the bed has to be raised so that the patient's body-weight may act as the counter-extension.

Bed.—During the war it was found important in the treatment of fractured femurs to make certain alterations in the bed. Eventually special beds were constructed, but at first much improvement in the patient's comfort and in the saving of time and labour for the nursing staff resulted from modifications of the existing beds. The wire mattresses were removed and sectional mattresses of canvas strips were supplied in their place. A smaller section was adjusted to correspond to the upper part of the thigh and anal region. This could be let down for dressing a wound or for the use of the bed-pan. The mattress proper was also made in sections, so that the desired portion could be removed at the same time.

When everything is ready, the extension strips are applied if that method be adopted. As soon as they are firm, an assistant steadies and extends the limb, while the surgeon, having soothed the thigh muscles by gentle massage, tries to set the fragments. If the broken ends do not come into good position, he should steady the fragments with local splints in case of struggling, and have a general anæsthetic administered. Having adjusted

the local splints again to hold the broken bone in good position, he slips on the bed-splint, and makes all the adjustments of extension and bed before the patient comes out of the general anæsthetic.

After three or four days the splint should be taken down, and while the limb is steadied and extended by an assistant, the thigh should be massaged and the knee-joint gently flexed. Massage should be repeated every three or four days, or oftener if there is much pain. One great cause of after-trouble is stiffness of the knee resulting from adhesions between the quadriceps extensor and the seat of fracture. For this reason, passive movement of the knee is begun early, and after about fourteen days the patient may move his knee voluntarily from time to time during the day, the range being gradually increased.

Dagron finds that union takes place in about eight weeks. When the patient begins to use the limb, the thigh should be supported by splints, the knee and hip-joint being free. A slight amount of weight put upon the bone hastens solidification, but the strain should be cautiously increased. Owing to the risk of an apparently firm callus yielding under the patient's weight, there is a great advantage in the use of a Thomas's caliper knee-splint when the patient first begins to go about. Failing that, crutches should be used. Under the massage treatment the patient can frequently lift his extended leg off the bed in about three weeks, but he is seldom able to be out of bed under eight weeks. As the patient gains in confidence he may dispense with one, then both crutches; but he should have the benefit of partial support, either by the caliper splint or by crutches, for eight or nine weeks after union is apparently firm. The old method of encasing the limb in plaster during convalescence should be discarded. It is a fertile source of permanent stiffness of the knee.

Fracture of the Femur in Children.—It is noteworthy that in children fractures of the femur are more frequently met with than fractures of the leg-bones; they are usually more or less transverse. Children are not easily kept quiet or dry, and therefore treatment is complicated by two conditions, unrest and moisture. We meet these difficulties by using the double long splint or vertical extension. The double long splint is, moreover, well suited for restless adults. It may be used with or without extension.

For fractured femur in infants Robert Jones recommends a Thomas's knee-splint applied as follows:—

"Extension plasters are applied to the leg below the fracture, and the limb is passed through the ring, which encircles the thigh at the groin, and which is padded over with felt, leather, and impervious oilskin. The thigh is pulled, and the extension is maintained by the plasters, which are affixed to the lower end of the splint. A bandage is placed round the limb, and no further treatment is needed than now and again to extend the limb by pulling at the plasters. The little patient can be carried, nursed, left to play on the floor, and no displacement of fragments is possible. It can be applied easily in five minutes, whether the child struggles or not, and an anæsthetic is never needed."

Fracture above the Condyles.—The diagnosis may be made by the unnatural lateral mobility and crepitus a little above the knee on attempted movement. Distortion may be masked by the swelling at the knee. A general anæsthetic should be administered, and, if the position of the fragments is doubtful, an *x*-ray photograph should be taken.

Treatment.—The special difficulty in treatment in this fracture is due to the backward displacement of the lower fragment by the gastrocnemius muscle; but the hamstrings also tend to cause over-riding. Fix thigh, knee, and leg in the flexed position in a Thomas's bed knee-splint with the hinged attachment already described, and apply caliper extension to the condyles. As an alternative, a double inclined plane for the thigh and leg may be used, with caliper extension if possible—or plaster applied to the skin round the condyles. Should the treatment fail to ensure a good position, the tendo Achillis should be divided and the limb treated in the straight position. Massage of the muscles of the thigh and of the knee-joint should be carried out daily. Passive movement must be reserved until pain and tendency to spasm have passed off. In about a week it may be cautiously begun, while the seat of fracture is steadied, care being taken that any movement produced takes place at the joint and not at the seat of fracture.

Fracture into the Knee-joint.—This is the result of direct injury; either condyle may be broken off, or the fracture may be T-shaped. The diagnosis is as in the last case.

Treatment.—Careful massage of the thigh and knee-joint; then the joint should be steadied with splints in a slightly flexed position, while extension with weight and pulley

overcomes the disturbing influence of the muscles which act upon the knee-joint. Passive and active movements must be used as soon as the pain and muscular spasm have sufficiently subsided, probably about the fourth or fifth day. Afterwards the sittings for massage and movements may be continued, at first daily, and then at longer intervals, the range of movements being gradually increased. Traction should be discarded as soon as the fragments will remain in position without it, generally in from fourteen to twenty-one days. An operation may be called for when the fragments cannot be properly reduced by manipulation.

Fracture of the Patella.—Caused most frequently by muscular action; sometimes by direct violence. The *diagnosis* is made from the history, from the great swelling without adequate cause other than that of a fracture, from the patient's inability to lift the leg from the bed, and from the presence of two separate parts of the patella—probably without crepitus, as blood-clot generally covers the broken surfaces.

Treatment.—The most rapid and the most complete return to functional usefulness is given by immediate operation, clearing out clots from the joint, and wiring the broken surfaces of bone together. On the other hand, there is probably no fracture in the body in which the risks to the patient's life and limb are greater than in that of the patella if the wound should become septic. Fibrous union, which is all that can be counted upon without operation, gives in many cases a good useful limb. The most serious obstacles to functional usefulness are adhesions in the joint and between the upper fragment and the surrounding parts. These can be obviated to a large extent by massage and early movement. Wharton Hood, after three or four days' massage, applied a strip of adhesive plaster three inches wide round the lower third of the thigh, and made his patient get up and walk about with the aid of a stick, renewing the plaster as it became loose. Tilanus advises the patient to walk in from six to twelve days, and Lucas-Championnière agrees with him. All advocates of the massage and movement method unite in condemning the older appliances by means of which the joint was rigidly fixed in an extended position for several weeks, and they have abandoned the various devices which were intended to bring the broken surfaces together. If operative treatment is contra-indicated, the following may be carried out.

For the first few days the limb should be steadied in a splint with the knee in the most comfortable position, probably that of slight flexion in a MacIntyre splint, or a gutter splint made of Gooch's splinting or pasteboard. The splint may be steadied with sand-bags. When pain has subsided, the limb may be left free in the bed. From the first, the muscles of the thigh and knee should be well massaged daily, to reduce the swelling and subdue spasm. When the massage is finished, the knee should be gently flexed. Lucas-Championnière found that a very slight range of movement sufficed to keep the joint supple, and thought it an advantage to allow the leg to lie free in bed as soon as the patient could comfortably do without support. While the foot rests on the bed, the patient may flex the thigh, and this flexes the knee. Dagron advises that semi-flexion should not be exceeded before the fifteenth day. The upper fragment should be steadied by the surgeon's hand, while passive movements are to be carried out, and the range of movement should be cautiously increased. As soon as possible the patient should be encouraged to walk on his leg. A light posterior splint to support the joint in the efforts to walk would provide security against the knee giving way. Although the range of passive movements can be extended by degrees, the weight of the patient's body must not be thrown upon the uniting structures for several months. Patients to whom it is important for any reason to be out of bed soon, will be able to walk about at once if fitted with a Thomas's caliper knee-splint.

Fracture of both Bones of the Leg.—If the displacement cannot be reduced after the muscles have been soothed by massage, the patient should be anæsthetized in order to facilitate free manipulation of the broken ends of bone while the muscles are relaxed. Only in a small proportion of cases will operation be required on account of the entanglement of soft parts, or of great displacement of the broken ends, not otherwise remediable. When mere over-riding from obliquity in the line of fracture is the cause of marked deformity or endangers the skin, extension upon the foot by weight and pulley for a week or two should be employed.

At first, while the muscles are inclined to contract in spasm, the patient will be relieved

if the foot, as well as the seat of fracture, be supported. After a few days there will be an advantage in allowing free play to the ankle, so that the patient may spontaneously move the foot from time to time between the surgeon's application of massage and movement. Hence a supporting splint which can be employed with or without a support to the foot will be best, but one with a fixed foot-piece which can be easily taken down for massage will serve the purpose very well. In about three weeks there is generally so little tendency to displacement that the limb may be allowed to lie in bed unsupported, or steadied only by lateral sand-bags. At this stage the patient may be allowed out, going about on crutches with lateral pasteboard or poroplastic splints which do not confine the knee- or ankle-joints. In favourable cases weight can be borne on the fractured leg in about six weeks.

Pott's Fracture of the Fibula.—

TREATMENT.—Where there is not much displacement, the limb should be well massaged, especially along the outside, to soothe the spasm of the peronei muscles. The patient should then by voluntary effort try to assist the surgeon in restoring the foot in position (*see* p. 352). The limb should then be again massaged and steadied with a Dupuytren's or a 'box' splint, or any form of leg splint which has a foot-piece. The splint should be removed for massage and movement daily, and at each sitting the foot should be brought nearer to its proper position, if it has not retained its position since it was replaced on the previous day. If the restoration is not complete on the first day, it will be better the second, and so on until it remains in position without difficulty. After about a week to ten days, the tendency to displacement will have passed off, and the patient will be able to move the ankle in all directions, with only a steadying hand placed over the malleoli. In from fourteen to eighteen days, if there is continued progress, the patient may be allowed to rest in bed with his foot tied in a pillow or quite free, and in about three weeks a supporting splint of plaster-of-Paris, poroplastic material, or pasteboard should be bandaged to the outside (or on both sides if required), and the patient should walk about with the aid of a stick. The surgeon must watch the effect of the patient bearing weight on the injured foot. If there is outward displacement, the treatment in bed must be continued, and the parts allowed to become more secure in their normal position before walking is attempted.

In cases in which the displacement outwards and backwards is very marked, the ligaments are more extensively torn, and the muscular spasm is sometimes so great as to endanger the vitality of the skin over the inner malleolus. If careful massage, aided by the patient as before, does not suffice to obtain a marked improvement in position, a general anæsthetic should be given and the deformity reduced. The leg should be fixed in a Dupuytren's splint and laid on its outside with the knee flexed; or preferably the foot and leg may be laid on an outside straight or gutter splint (Cline's), with thick padding under the outside of the foot, and steadied there with a bandage. Massage should be performed daily, and after the muscles have been soothed the foot should be guided into position until it can be inverted by the patient's own efforts, supplemented by gentle traction by the surgeon. The subsequent treatment is similar to that described for cases with slight displacement, with the difference that the stages are more prolonged. Since the tendency to outward displacement remains after six or seven weeks of treatment, the patient when first beginning to walk should have the inside of the boot raised so as to throw the foot on its outer edge, while the foot is strapped to a steel carried along the inner side of the leg and fixed into the heel. The steel must be bowed opposite the inner malleolus if the skin there is tender. To the steel are fixed straps which draw the foot and ankle inwards when the patient bears weight on the foot (Jones). Sometimes the posterior tip of the lower articular surface of the tibia is broken off. The foot will then slip backwards very easily. Extension of the foot with a weight should be tried, and, failing success with that, an operation will have to be considered.

Fractures of the Tarsal Bones.—The bones frequently fractured are the astragalus and the os calcis. The causes are falls on the heel, crushes, and twists. Diagnosis will be made from the history of the accident, from distortion of the foot, and from crepitus elicited by careful manipulation. An *x*-ray photograph is important.

TREATMENT.—Rest in bed, massage, and movements carried out on general principles. An operation will be advisable when, for instance, the bony portion where the tendo Achillis

is inserted is torn off, or when the broken astragalus becomes displaced and hinders the proper use of the joint.

Fractures of the Metatarsal Bones occur as the result of direct injury, or from marching, or dancing. Diagnosis is based on the history, the presence of swelling, pain, tenderness, and crepitus.

TREATMENT.—Rest and massage. *Charles W. Cathcart.*

FRAMBŒSIA TROPICA.—(*See* YAWS.)

FRECKLES.—As freckles give rise to no symptoms, they call for treatment only when they are very numerous on exposed parts, and cause disfigurement. On the face they may be prevented by the wearing of a brown or red veil, as they are produced by the actinic, and not by the heat, rays of the sun.

There are numerous methods for removing them, and the object of most of these is exfoliation of the epithelium containing the pigment. By far the best agent is corrosive sublimate in one or other form. Other remedies are certain acids—e.g., nitric, hydrochloric, or lactic—caustic alkalis, borax, bismuth compounds, and peroxide of hydrogen. A simple application is 1 per cent solution of $HgCl_2$ in alcohol, applied daily until irritation is produced. Unna recommends the application of a peeling paste of resorcin (50 per cent in zinc paste). This necessitates the patient's staying in the house. He also recommends the following ointment :—

℞	Unguenti Zinci	30 parts	Adipis Lanæ	5 parts
	Bismuthi Subnitratis	1 part	Hydrargyri Ammoniati	2·5 parts
	Olei Olivæ	5 parts	Sol. Hydrogenii Peroxidi 10%	20 parts

The following is recommended in Vienna :—

℞	Hydrargyri Ammoniati		Barii Sulphatis	āā 1 part
	Bismuthi Subnitratis		Vaselini	30 parts

Norman Walker.

FRONTAL SINUSITIS.—(*See* NOSE, ACCESSORY SINUSES OF.)

GALL-BLADDER, INFLAMMATION OF.—(*See* CHOLECYSTITIS.)

GALL-STONES (Medical Treatment).—Treatment based on the possibility that gall-stones may be dissolved (while in the biliary passages) by various solvents is sometimes recommended ; but solvents of a sufficient strength cannot be administered without seriously injuring the mucous membrane of the alimentary tract. In weak solutions none of the so-called saline cholagogues have any solvent effect. Dr. Brockbank found that a 1 per cent solution of salicylate, phosphate, benzoate, bicarbonate, or sulphate of soda produced no loss of weight in biliary calculi allowed to stand in them for fourteen days.

Olive oil has been recommended as a solvent for gall-stones, and experiment shows that if a gall-stone be placed in olive oil it gradually loses a large percentage of its weight, and may break up into small pieces. The same result is produced by oleic acid and by animal soaps. Doubts, however, are expressed as to whether administration of olive oil can have any influence on gall-stones in the biliary passages, as the oil as such cannot enter into these tracts. But, as Brockbank points out, oils and fats become disintegrated in the alimentary canal, and pass into the blood as an unchangeable fat, a fatty acid, and as soap, all three of which dissolve cholesterin readily and break up a gall-stone. It is possible, then, that the substances resulting from the digestion of the oil so reduce or soften gall-stones in the biliary channels that they pass into the intestine, or, even short of that, may become less angular and produce less discomfort.

Certainly, many authors have found that administration of olive oil gives more relief than any other medicinal measures to patients suffering from symptoms of cholelithiasis. The oil should be given in 3- or 4-oz. doses in the early morning, or at any rate on an empty stomach. Oleate of soda is sometimes given instead of olive oil. Glycerin, 1 oz. daily, is recommended, but is less efficacious than olive oil.

Massage was recommended by the late Dr. G. Harley, with the object of expelling

gall-stones from the gall-bladder, but seems likely to produce injury to the biliary passages, and is not to be advised.

Turpentine has been stated to bring about expulsion of calculi, but Prevost's and Benet's experiments show that it can only enter the bile in very small amount, and though turpentine does bring about expulsion of some renal calculi, the author has not found any such result in cases of biliary calculi.

Although gall-stones cannot be dissolved in the biliary passages, treatment may lessen the formation of fresh ones and the enlargement of existing calculi.

Various diets are recommended. All food, and more especially protein food, is found to increase the secretion of bile acids which dissolve cholesterin; hence free meat-eating has been advised, but this tends to digestive disturbances, which should be avoided, and a mixed meal produces the best effect on account of the active chymification to which it gives rise (Ritter). Fatty food is often ill digested (though olive oil may be well borne), and rich and highly spiced food is to be avoided; but cholelithiasis does not call for any further restriction in diet (Naunyn), and the best diet for a patient with tendency to gall-stones is plain roast and boiled, without excess of meat. Free drinking of liquid is to be encouraged, though water is not a cholagogue; alcohol is unnecessary or injurious, but Vichy and Seltzer water are useful.

Exercise—walking, gymnastics, and swimming—are very necessary; gentle abdominal massage is recommended. No tight corsets or other tight clothing should be worn.

Constipation is to be met by occasional 1-gr. doses of calomel, and if aperients are needed more often, phosphate or sulphate of soda or Vichy water.

Among cholagogues there is none comparable in effect with that of a full meal (Naunyn), but salicylate of soda increases and renders the bile more liquid, and the bile acids are also good cholagogues.

There is a very general experience in favour of warm sodium waters such as Vichy (temp. 110°), Carlsbad (158°), Neuenahr (95°); and Naunyn testifies to the favourable results of Carlsbad treatment in long-standing and unfavourable cases of cholelithiasis.

When biliary calculi pass into the bile-ducts and jaundice results, or when they pass into the cystic duct without the production of jaundice, biliary colic may arise. This is of every degree of severity, the exhaustion and collapse becoming dangerous in the worst cases. Unless there be any contra-indication, a hypodermic injection of morphia $\frac{1}{4}$ gr. should be given at once. There seems no reason why this, the most effective measure, should be kept as a last resort, but a hot bath, hot fomentations with or without belladonna, and chloroform inhalation are also recommended. The drinking of hot weak solutions of bicarbonate of soda was recommended by Prout to relieve the retching on an empty stomach.

In many cases stone in the gall-bladder is accompanied by symptoms so slight as to be neglected or ignored by the patient, and the diagnosis may be very difficult; but persistent attacks of dull pain—especially after meals—nausea, and slight pyrexia may suggest it; even in these cases serious results may ultimately ensue. Where the symptoms render it fairly certain that gall-stones are present in the biliary canals, the question of operation arises. No doubt the symptoms may eventually entirely subside, after or without repeated attacks of colic, the stone passing onwards or subsiding into quiescence in the gall-bladder. But on the other hand, the dangers of gall-stones are many: abscess, sloughing, or gangrene of gall-bladder, ulceration through the bile-ducts, infective or suppurative cholangitis, and intestinal obstruction being among the number. And when a gall-stone remains impacted in the bile-duct, persistent jaundice adds a danger which cannot be ignored.

Stone in the cystic duct produces no jaundice; nevertheless it may lead to great distention of the gall-bladder, and sometimes to its sloughing or abscess. Suppuration in the gall-bladder may be suspected when there are attacks of biliary colic without jaundice, and when the gall-bladder *suddenly* becomes enlarged and tense; such cases demand immediate operation, even if apyrexial. Calculi in any part of the biliary passages, gall-bladder, or ducts are liable to lead to development of cancer. Naunyn states that cancer of the gall-bladder never occurs without calculi; the same appears true of cancer of the bile-ducts, and cancer of the pancreas is frequently associated with

biliary calculi. This is a danger increasing with the duration of the stay of the calculus in the biliary canals ; and, in the author's opinion, calculi should be removed by operation in all cases in which the general condition of the patient allows, even if the only reason be the tendency to development of malignant disease. *Sidney Phillips.*

Surgical Treatment.—When the presence of gall-stones has be n diagnosed, the question at once arises whether the case is suitable for medical treatment or whether operation should be advised. The following are the main points to be considered :—

1. Medical treatment gives relief in mild cases, but can never cure the patient ; there is no drug known which can cause any absorption of gall-stones ; some of the stones may pass down the ducts into the intestine, but most will remain in the gall-bladder.

2. Whilst stones are in the gall-bladder, there is always the risk of their setting up an acute inflammatory condition, or of one becoming impacted in the common duct ; operation will then have to be undertaken under serious conditions, involving decided risk ; on the other hand, the operation for stones confined to the gall-bladder and the cystic duct is one of the simplest and safest in abdominal surgery.

3. It has been clearly proved that there is a very close relationship between gall-stones and carcinoma of the gall-bladder and ducts, and further, it seems that malignant disease arises far more frequently from stones which have caused trouble during life than from latent stones. Sir Humphry Rolleston states that carcinoma of the gall-bladder and ducts occurs in from 4 to 14 per cent of all persons with gall-stones. This is a strong argument in favour of operation in the earlier stages.

4. The age and general condition of the patient must be considered. It may be laid down as an absolute rule that in all young healthy subjects with definite signs of gall-stone disease, operation should be urged ; but many of the subjects are elderly and feeble, and in some of these operation should not be advised unless the indications are urgent.

Palliative Treatment is justifiable in the following cases : (1) Those in which there are mild attacks, the patient being quite free from symptoms in the intervals, and without tenderness or swelling in the gall-bladder region ; (2) Cases of patients who are old, feeble, and obviously in bad general condition : operation would then not be advised unless the local condition were seriously threatening life ; (3) Palliative treatment is indicated in the early stage of impaction of the stone in the cystic or common duct, unless there are also signs of local peritonitis or septic infection ; some of these impacted stones pass into the bowel after a few days' palliative treatment, and then, if an operation upon the gall-bladder or duct is thought advisable, it can be performed in favourable circumstances later. Jaundice due to stone impaction, and lasting more than three weeks, is unlikely to be relieved by medical treatment ; in a few cases the stone ultimately passes into the bowel, and this involves a serious and often long illness, which could be avoided by operation at a much smaller risk.

Operative Treatment is indicated in the following circumstances : (1) Attacks of definite biliary colic recurring in spite of medical treatment : there are many women who suffer for years from the pains and discomforts of gall-stones who would at once be relieved by operation ; medicine is usually powerless to check recurrence of the attacks in these cases, whilst complete relief is the rule after operation, recurrence being very exceptional ; (2) Peritonitis is always a clear indication for operation ; mild localized peritonitis may often be allowed to subside under palliative treatment, but, when this has occurred, operation should be insisted upon ; any more severe degree of peritonitis demands immediate laparotomy ; (3) Septic infection involving the gall-bladder or ducts, showing itself by fever, rigors, etc. ; (4) Definite and persistent swelling of or around the gall-bladder ; (5) Jaundice of more than three weeks' duration.

Operations.—

Cholecystostomy is the operation most often performed for gall-stone disease. The gall-bladder is exposed by an incision through the outer part of the rectus muscle ; it is then incised, the stones are removed, and a rubber tube about half an inch in diameter and with no lateral perforations is inserted into the opening in the gall-bladder and fastened by means of two purse-string sutures of catgut. The gall-bladder is then allowed to drop back into position, and the abdominal wall is closed around the tube. The drainage tube should be arranged to lead into a receptacle by the side of the patient,

in which the bile is received. The cystic and common bile-ducts must always be carefully examined, for it is essential that they should be clear. Free drainage usually occurs for from two to four weeks, and the wound then closes, provided of course that the ducts are patent.

Cholecystotomy is the operation in which the opening made in the gall-bladder is closed by suture after removal of the stones. This operation is seldom practised, for the risks of leakage are great, and moreover it is recognized that drainage of the gall-bladder is essential for the cure of the chronic inflammation which is almost always found in association with gall-stones.

Cholecystectomy is undoubtedly the best operation for certain cases of gall-stone disease in which there is no doubt that the common duct is patent, and it is probable that in the future it will be performed more frequently than is at present the custom. In this operation the gall-bladder with its stones is completely removed, and the cystic duct is closed by suture and a peritoneal flap. The operation is at least as safe as cholecystostomy; it is a radical measure, corresponding closely to the removal of the diseased appendix; recurrence of stones and the possibility of malignant disease starting in the damaged gall-bladder are prevented; the convalescence is shorter. The loss of the gall-bladder causes no inconvenience whatever to the patient; digestion is in no way affected.

Choledochotomy is the operation by which stones impacted in the common bile-duct are removed by incision of the duct; if, however, the stone is situated in the terminal portion of the duct, and it is impossible to manipulate it into the upper part, the stone is best removed by incision through the anterior wall of the duodenum. *Crisp English.*

GANGLION.—The following methods of treatment may be adopted:—

1. *Counter-irritation with Pressure.*—The swelling is painted with tinct. iodi fort. and firmly bandaged or strapped. In a certain number of cases this will be successful.

2. *Puncture.*—A tenotome is inserted beneath the skin, with due regard to the anatomy of the part, and the swelling is freely incised, a valvular opening being made. Pressure is then exerted over the swelling, so that its contents are extruded. A collodion dressing is applied with firm pressure, so that the walls of the cavity are brought into apposition. It is better to allow the gelatinous contents of the ganglion to escape externally rather than into the cellular tissues, and the whole proceeding must be conducted under the most careful asepsis, or very serious, even disastrous, results may occur.

3. *Excision.*—When a ganglion resists the above methods of treatment, or when the surgeon and patient both desire a speedy cure, the ganglion may be exposed by a free incision and dissected out. The tendon sheath, or sometimes a joint cavity, may be opened, but if absolute asepsis is maintained there is no danger. Subsequently, early movement of the part must be undertaken to prevent the tendon from becoming fixed by adhesions. (*See also* TENDONS AND TENDON-SHEATHS, INFLAMMATION OF.)

W. H. Clayton-Greene.

GANGRENE.—The various causes of gangrene are not considered in this article, but mention must be made of the close association of diabetes and Bright's disease with this condition.

TREATMENT.—There are two main forms of gangrene: *dry* and *moist.*

In Dry Gangrene the arterial flow is checked, but the return of blood and fluids along the veins and lymphatics is not interfered with. As the result of this the tissues die and shrivel up, undergoing a process of mummification without the occurrence of any septic changes. If untreated, in the course of time the dead material is cast off by the action of the granulation tissue which springs from the living parts at the *line of demarcation* between the living and the dead. This line of demarcation is not immediately defined, and, even when amputation is considered necessary, it is advisable to wait until this limitation is established before deciding on the actual operation which is to be performed.

As a rule it may be said that the treatment of dry gangrene is amputation—in such a situation as will ensure the flaps being nourished adequately; and since the blood-supply of a limb is richest in anastomosis in the neighbourhood of the joints, these localities are usually selected.

In deciding on the particular form of amputation, preference should be given to that variety in which the flaps, while adequate for covering, are short and vascular, so that as little strain as possible will be thrown upon the failing circulation of the part.

In certain cases where constitutional disease is advanced, or where the arterial degeneration is very marked, no radical treatment should be attempted. The gangrenous parts should be cleansed and dressed antiseptically, and the natural separation assisted by the division of tendons and other resistant structures. Such treatment is not satisfactory, while the process of separation is often productive of very great pain.

In some cases of diabetic gangrene, excellent results have been obtained by amputation, and the amount of sugar in the urine has been found to diminish after the removal of a gangrenous extremity.

In Moist Gangrene, on the other hand, we meet with a condition where the return of the fluids, blood, and lymph has been prevented. In this variety the tissues remain sodden with their contained fluids, and form a suitable medium for the development of micro-organisms. Moist gangrene is not necessarily septic, but the conditions are so favourable to micro-organisms that septic changes are almost inevitable. In cases where this variety of gangrene is feared—that is, where there has been interference with the venous return from a limb—every care should be taken to keep the parts aseptic, and a thorough toilet of the skin should be undertaken. The hairs should be shaved off, the limb should be well washed with ether, soap, turpentine, and spirit, special attention being directed to the limb folds and the regions of the nails, and a large antiseptic dressing should be applied. If, owing to these precautions, no septic complications arise, it is right to wait until a line of demarcation is defined before proceeding to amputation ; but should the appearance of the limb and the condition of the patient suggest a septic state, no time must be lost in performing an amputation well above the gangrenous area.

The treatment of *senile gangrene* consists in practising amputation at a convenient spot as soon as the line of demarcation has declared itself, or in waiting for the natural process of separation of the dead from the living tissues, assisting it occasionally by division of a resistant structure. This form of gangrene is generally due to arterial sclerosis with blocking of the main vessel, and it is advisable, before deciding on the particular operation to be performed, to ascertain whether the main vessel of the limb is obstructed for some distance above the gangrenous area. Whenever amputation is attempted, the incision should pass through healthy tissue well above the disease, and short vascular flaps should be formed. In senile gangrene of the foot, it is better to amputate through the lower third of the thigh than to attempt any operation below the knee.

Anastomosis of the artery and vein has been tried in some cases of threatening dry gangrene. One or two successful cases have been published, but the writer does not think the method is to be recommended generally.

Raynaud's Disease.—For the milder forms of this disease in which necrosis has not occurred, the best forms of treatment are massage, electricity, and hydrotherapy ; these are persisted in with the hope that the sluggish circulation may be re-established.

Barlow recommends the following procedure : " Immerse the extremity in a large basin containing salt and tepid water ; one pole of a constant current battery is placed in contact with the upper part of the limb above the level of the water, and the other pole in the basin, the salt and water being thus converted into an electrode. As many elements as the patient can comfortably bear should be employed, and the current should be made and broken at frequent intervals, so as to get repeated moderate contraction of the limb. The patient should also move the digits ".

Radiant heat is sometimes satisfactory in relieving the pain. In the severe form with necrosis, the pain must be relieved by local sedative applications ; lead and opium lotions, fomentations, and morphia may be required.

Cushing advises a modification of Bier's treatment in order to re-establish the circulation. The limb is firmly bandaged for one or two minutes, until it is completely anæmic ; the bandage is then relaxed, and a period of active hyperæmia succeeds the period of anæmia. The process is painful, but is of distinct benefit.

Local treatment of the gangrenous areas consists mainly in assisting the natural process of separation, as in the senile variety. The parts must be kept dry and aseptic

as far as possible ; heat, either dry or moist, is of service when the pain is severe. Radical treatment is rarely indicated. (*See also* RAYNAUD'S DISEASE.)

Spreading Traumatic Gangrene belongs to an entirely different category. It is a form of gangrene following wounds contaminated with earth into which the bacillus of malignant œdema finds its way. This deadly disease should be suspected in cases of lacerated wounds and compound fractures when the limb becomes swollen and œdematous very shortly after the infliction of the injury, and when an emphysematous crackling can be felt on examining the tissues. Once established, the process spreads with fearful rapidity, and nothing short of immediate amputation can give the patient the barest chance. In cases where this condition is suspected, cultures should be made from the wound, and the patient should be very closely watched ; if the bacillus is found, or if the process spreads, the limb must be removed as near the trunk as possible. In spite of prompt treatment, death is the usual result. *W. H. Clayton-Greene.*

GASTRALGIA.—By this is meant that painful form of dyspepsia met with so commonly in young, anæmic women, which is probably due to the occurrence of erosions or small acute ulcers in the gastric mucous membrane. It used often to be spoken of simply as 'gastric ulcer', though that term is now reserved for the chronic ulcer met with in middle-aged persons. It has also been called gastrostaxis and hæmorrhagic gastralgia from the frequency with which hæmatemesis occurs in it.

In order to achieve success in its treatment it is very advisable to send the patient to bed. Failure is usually due to a neglect of this precaution. The management during the first week is the same as in DUODENAL ULCER (q.v.), but after this, if all is going well, the diet may be pushed on rapidly, and in most cases pounded meat and fish may be begun by the end of the second week.

Bismuth in full doses should be given at first, but after a week it should be combined with iron, e.g. :—

℞ Bismuthi Carbonatis | Ferri Carbonatis Saccharati āā gr. xv

Thrice daily.

Or an aperient iron mixture may be given :—

℞ Ferri Sulphatis	gr. iij	Syrupi Limonis	ʒj
Acidi Sulphurici Diluti	♏x	Aquam Menthæ Piperitæ	ad ʒj
Magnesii Sulphatis	gr. xxx–ʒj		

Thrice daily after food.

If pain is severe, small doses (gr. $\frac{1}{20}$) of morphia may be given, or 5 to 10 min. of tinct. chloroform and morphine added to the bismuth mixture.

For the treatment of hæmatemesis, see special article.

The after-treatment is the same as that of duodenal ulcer. *Robert Hutchison.*

GASTRIC CRISES.—(*See* TABES.)

GASTRIC ULCER.—The treatment of acute gastric ulcer is described under GASTRALGIA (*see also* HÆMATEMESIS). In chronic gastric ulcer the best treatment (in the writer's opinion) is by operation ; but in cases of short standing, or if operation be contra-indicated or refused, medical treatment may be carried out on the same lines as in DUODENAL ULCER (q.v.). *Robert Hutchison.*

Surgical Treatment.—Our conception of *gastric ulcer* has entirely changed in recent years ; formerly considered easy of diagnosis, it is now known to be difficult even in long-standing cases. For this reason the prognosis of cases not verified by operation is entirely a matter of conjecture.

Two distinct lesions are included under the term gastric ulcer : the acute ulcer, frequently multiple ; and the indurated chronic ulcer, usually single. It is evident from the discrepancy between the sex-distribution in the medical and surgical statistics that there are two distinct conditions—one more common in women, in which acute ulceration followed by perforation may occur ; the other more frequent in men, in which the

immediate cause of death is not uncommonly hæmatemesis, and in which perforation is uncommon.

The cases formerly diagnosed gastric ulcer in young women are usually examples of extra-gastric disease, with, in many cases, acute gastritis or mucous ulcers due to septic infection. The relationship between the two groups is at present obscure. Careful medical treatment of this group of cases, if the condition causing the gastric disturbance (septic teeth or chronic constipation) can be dealt with, is successful; but if disease of the gall-bladder or the appendix is responsible, treatment of these alone will cure.

In chronic gastric ulcer, in addition to the dangers from hæmorrhage, perforation, and malnutrition the result of stricture, there is the appreciable risk of the development of carcinoma.

Operative treatment should not be undertaken—except when perforation has taken place or in certain cases with hæmatemesis—until all septic foci in the mouth or elsewhere have been attended to, and the patient subjected to a thorough course of medical treatment. If this fails to relieve, or relapses occur, operation should be carried out. It offers the patient almost certain relief, with a more than 80 per cent prospect of cure, at a very slight risk. In no case should the surgeon set out to perform any stated operation; he must be prepared to change his plans, and to treat the disease causing the symptoms. It is never permissible, for example, to perform gastrojejunostomy in the absence of definite evidence of ulcer.

Before operation the mouth should be carefully attended to and septic teeth treated. For the twenty-four hours preceding operation nothing but sterilized food is given, but the patient does not necessarily remain in bed. Gastric lavage is not carried out unless a stricture is present at the pylorus or in the body of the stomach (hour-glass stomach).

In opening the abdomen, an incision is made an inch to the right of the middle line; after dividing the anterior sheath of the rectus, the muscle is retracted outwards and its posterior sheath and the peritoneum incised in a line with the anterior. The whole stomach and duodenum are then examined from end to end. If an ulcer needing surgical treatment is present, it can always be seen or felt. Gastrojejunostomy should never be carried out unless the ulcer can be demonstrated. The condition of the gall-bladder, appendix, and lower ileum should always be investigated, and lesions treated.

Perforation.—Perforation, though usually acute, may be chronic, a subphrenic abscess forming. Immediate operation should be carried out. If, as is usual, the perforation is acute and on the anterior surface of the stomach, it may be excised, or buried with through-and-through stitches of hardened catgut buried by a Lembert stitch of catgut. Other perforations should be looked for. If there has been much peritoneal soiling, the extravasated fluid should be gently wiped away; irrigation should not be carried out. If drainage is necessary, this should be done by tubes inserted through a separate incision into the kidney pouch and pelvis as required, and the anterior wound closed.

When the ulcer that has perforated is a chronic one, it may be impossible to bury it. If the condition of the patient will admit, it should be excised; or, failing this, covered with an omental graft.

Gastrojejunostomy should be carried out at the same time if possible. It is unnecessary in acute ulcer. If the perforation is recent, search should be made for other abdominal disease.

Chronic Gastric Ulcer.—As in chronic duodenal ulcer, the whole abdomen must be thoroughly investigated. Simple chronic ulcers that are not adherent heal after gastrojejunostomy correctly performed, no matter in what part of the stomach they are situated. Posterior gastrojejunostomy is the operation of choice in all 'free' ulcers in which there is no suspicion of malignancy. In these and in all adherent ulcers—the common type of which is posterior eroding the pancreas—partial gastrectomy should be carried out.

Hour-glass Stomach.—As a rule there is only one constriction present, that caused by the ulcer on the lesser curvature; occasionally pyloric stenosis is present in addition, as the result of a chronic duodenal ulcer. Treatment is that of the ulcer causing the condition. In many cases partial gastrectomy is necessary.

Hæmatemesis.—Operative interference is *never* indicated in the hæmatemesis of young women. Bleeding is usually occurring from many foci, and continues unchecked in spite of gastrojejunostomy.

It is otherwise when the bleeding occurs from a chronic ulcer. The death-rate, apart from operation, is over 50 per cent. Operation should be carried out as soon as possible after the first hæmorrhage; this is usually within twenty-four hours. The bleeding point should be directly controlled by excising the ulcer or by ligaturing the vessel on either side of it, combined with inversion and gastrojejunostomy.

Post-operative Treatment of Gastric and Duodenal Ulcers.—As much water is given to drink as the patient wishes. Vomiting is unusual; if at all frequent or copious, the stomach should be gently washed out and kept empty. As soon as wished, Benger or Allenbury food is given, and food very gradually increased, and no effort made to hurry on to solid food.

For at least three months from the date of operation I enjoin them to be careful in their diet, to avoid alcohol, roast beef, ham, and bacon, and to take a powder composed of equal parts of bismuth oxycarbonate, heavy magnesium carbonate, and sodium bicarbonate, one drachm three times a day between meals. The bowels should be kept regular; when tolerated, liquid paraffin acts excellently in these cases. In many patients, however, in whom constipation was a troublesome feature before operation, the action of the bowels becomes regular. Patients should be kept under observation for a considerable time. If complaint is made of gastric discomfort, a test meal should be given; if the acidity is found to be above normal, a course of treatment should be adopted to diminish it.

Three complications may occur after gastrojejunostomy:—

1. *Vomiting.*—In patients in whom operation is difficult owing to their stoutness or to trouble with the anæsthetic, vomiting of large quantities of bile may occur in the first twenty-four to forty-eight hours. This I am accustomed to call paralytic regurgitant vomiting. It yields readily to lavage.

True regurgitant vomiting is the result of obstruction in the region of the anastomosis, and is extremely rare after modern operation. Treatment consists in keeping the stomach empty by tube passed each night. As the quantity removed diminishes, the treatment is carried out on alternate nights, and then with gradually increasing intervals. If no diminution takes place, lateral anastomosis between the afferent and efferent limbs or, if this is impossible, duodenojejunostomy must be done.

A few patients complain of occasional morning vomiting of bile. As a rule no treatment is necessary. If it is really troublesome, a course of lavage will often relieve it.

2. *Diarrhœa.*—It has been stated that intractable diarrhœa may result. I have not yet come across this. In three cases after gastrojejunostomy for chronic gastric ulcer with a low acidity, diarrhœa developed; in all it yielded at once to the administration of dilute hydrochloric acid.

3. *Secondary Ulceration.*—This is the complication most feared. It is at the present time met with in less than 2 per cent of the cases operated on. The ulcer may originate either at the anastomosis—gastrojejunal or anastomotic—or in the jejunum, usually on its anterior surface immediately beyond the anastomosis. The former is due in most instances to the use of unabsorbable suture material; in my experience it does not occur when catgut only is used for the anastomosis. True jejunal ulcer is most frequently met with in men after operation for chronic duodenal ulcer; it is rare in women, and after operation for chronic gastric ulcer. It occurs in those cases in which the operation fails to reduce gastric acidity sufficiently and in which the original cause of the ulcer is still acting, or the jejunum is bruised by the clamp. Careful exploration of the whole abdomen, abolishing the duodenal clamp, and judicious after-treatment will render this condition a rarity.

Pain, one to three hours after food, often relieved by food, waking the patient about 2 a.m., and felt to the left of the umbilicus, is the common symptom of this complication. It is impossible to distinguish the two varieties of ulcer by the symptoms. Perforation into the free peritoneal cavity is rare after the posterior no-loop operation, but in a few cases a profuse hæmatemesis is the first symptom. Gastric acidity is always high.

If a thorough course of medical treatment fails to cure, operation should not be delayed. In neglected cases perforation takes place into the colon, with the formation of a gastrojejunocolic fistula. No rules can be laid down. It is sometimes possible to excise the ulcer and to suture the opening in the jejunum, but more often the whole

anastomosis has to be excised. In these cases both ends of the jejunum should be separately implanted into the stomach, so that the whole of the bile and pancreatic juice passes through it.

If thorough abdominal exploration was not carried out at the first operation, it should be done, and lesions in other organs dealt with. *James Sherren.*

GASTRITIS, ACUTE AND CHRONIC.—The dietetic treatment should, as far as possible, involve rest to the stomach, and abstinence from all food which is irritating from its chemical composition or its mechanical state. A quite recent attack, of only a few hours' duration, may be successfully treated by drinking 20 or 30 oz. of warm water, so as to dilute the gastric contents, and if the pain does not subside, by emptying the stomach, either by tickling the pharynx, or giving a sulphate of zinc emetic (20 gr.); the food should be hot water, or milk diluted with two parts water, for the rest of the day, and on the following day only the blandest food should be taken.

The following articles of diet are forbidden to persons suffering from gastritis in any form: all fats, including butter, which should at most be taken very sparingly, pork, smoked and salted meats, ham, bacon, veal, salmon, mackerel, eels, lobsters, and crab; all fried and greasy dishes; porridge, brown bread, pastry, uncooked fruit; all fruit containing seeds and skins, or until these have been removed; nuts of all kinds; raw vegetables, salads, radishes, cresses, mushrooms, carrots, turnips, parsnips; pickles, sauces, pepper; cheese, cream cheese; malt liquors, spirits, port, madeira, sherry, Indian and Ceylon teas, iced water and iced creams.

During convalescence from an acute attack, and in chronic cases, the diet should be something like the following:—

Breakfast.—Toasted white bread; white fish, boiled or broiled; cocoa, coffee, or China tea infused with milk; no butter.

Luncheon.—A slice of mutton, or a mutton chop without fat; mashed potatoes; milk pudding; water or claret or still moselle and mineral water.

Tea.—China tea, infused with milk; Madeira cake.

Dinner.—No soup; white fish, boiled or broiled; lean beef or mutton; fowl or game lightly cooked; mashed potatoes or any tender green vegetable; baked custard or stewed fruit, without cream; water or claret or still moselle and mineral water.

The following course of treatment will be found useful. Two 5-gr. blue pills should be ordered, of which the first should be taken at bedtime, and the second two nights later, the patient being told not to repeat these pills. Either the rhubarb and bismuth mixture, or the compound bismuth powder, should be given before each meal:—

℞				
Sodii Bicarbonatis		Mucilaginis Tragacanthæ	℥xv
Bismuthi Carbonatis	āā gr. x	Aquam Menthæ Piperitæ	ad ℥j
Pulveris Rhei	gr. iiss		

Two tablespoonfuls to be taken before each meal.

℞			
Sodii Bicarbonatis		Pulveris Rhei	gr. iiss
Bismuthi Carbonatis	āā gr. x	Pulveris Cinnamomi Co.	gr. v

M. Ft. pulv. Mitte xij. A powder to be taken in a little milk before each meal.

Half a tumblerful of hot water should be sipped slowly the first thing in the morning, and to this may be added a teaspoonful or more of the effervescing sulphate of soda, if the bowels need assistance.

Chronic Catarrh of the Stomach.—In regulating the diet, those articles already enumerated which may cause irritation must be eliminated, and, for a time, a stricter regimen may be necessary. The two main lines of dietetic treatment are: (1) *Milk*, which should be diluted with barley-water or soda-water, and be preferably sterilized; (2) *Minced lean meat*, which should be prepared in the same way as the Scottish national dish called collops. This minced meat is eaten without condiments, bread, or vegetables, but hot water *ad libitum* may be allowed two hours after meals. Many cases which resist milk diet improve rapidly upon minced meat, and it is, perhaps, most useful in cases where there is hypersecretion of gastric juice.

The most useful drugs are bicarbonate of soda, sulphate of soda, bismuth, magnesia,

and mercury, the last in the form of calomel or blue pill. The treatment should commence by a course quite similar to that given in subacute gastritis; but when the gastric irritability has been allayed, the following acid mixture may be usefully continued for some time:—

℞ Acidi Nitrohydrochlorici Diluti		Succi Taraxaci	℥j
Tincturæ Nucis Vomicæ	āā ♏x	Aquam	ad ℥j

Two tablespoonfuls three times a day directly after meals.

This seems to be indicated where the urine deposits amorphous alkaline phosphates; acidol tablets dissolved in half a tumblerful of *eau sucrée* fulfil the same object, and have the advantage that they can be carried in the pocket. If the patient is troubled by acid eructations, one of the following mixtures should be given:—

℞ Sodii Bicarbonatis		Mucilaginis Tragacanthæ	♏xv
Bismuthi Carbonatis		Aquam Menthæ Piperitæ dest.	ad ℥j
Magnesii Carbonatis	āā gr. x		

Two tablespoonfuls three times a day or before each meal.

℞ Olei Olivæ	℥j	Aquam	ad ℥j
Pulveris Tragacanthæ	gr. xx		

Two tablespoonfuls before each meal.

If the appetite is bad, give the following:—

℞ Sodii Bicarbonatis	gr. x	Tincturæ Zingiberis fort.	♏v
Tincturæ Rhei	♏xxx	Infusum Gentianæ Co.	ad ℥j

Two tablespoonfuls before each meal.

The bowels must be kept freely open, if necessary by the use of aperients, such as effervescing sulphate of soda or Rubinat water; or in patients of spare and nervous habit, a pill of aloes or cascara.

Robert Saundby.
(Revised by Robert Hutchison.)

GASTROPTOSIS.—In the treatment of gastroptosis there are three objects to be aimed at: (1) The cure of the underlying neurasthenia; (2) The removal of any functional disorder of the stomach which co-exists; (3) The correction, if possible, of the malposition of the organ.

1. The great majority of patients who exhibit gastroptosis are the subjects of neurasthenia, to which, and not to the displacement of the stomach, many of their troubles are due. When the neurasthenic symptoms are at all pronounced, it is advisable to begin treatment by a rest cure (*see* NEURASTHENIA). This will comprise rest in bed for at least four weeks, with abundant feeding, massage, the use of enemata to correct constipation, and, for the first week at least, the application of hot fomentations to the abdomen. The help of a good nurse who understands massage is essential, but it is not imperative that the treatment should be carried out away from home, although the visits of relatives and friends must be rigidly restricted.

The diet must be abundant, six small meals of easily digested food being given in the day, and bulky, innutritious articles (e.g., fruits and green vegetables) avoided. Fluids and solids should, as far as possible, be given separately. Cream and other forms of fat should be taken freely.

Bromides are usually required during the first week or two of the rest cure. Massage is performed twice daily in the usual way, but the use of electricity may be dispensed with.

2. The usual co-existing functional disorders of the stomach are defective motility (atony) and diminished or, more rarely, increased secretion. Some degree of gastritis, however, as manifested by a furred tongue, loss of appetite, and nausea, is often present when the patient first comes under treatment. This should be remedied by the administration of a rhubarb and soda mixture with the addition of a grain of blue pill and three grains of compound rhubarb pill every night. When the tongue has become clean, one can proceed to deal with the atony and any disorder of secretion which may be present. As regards the former, abdominal massage is of great help, and with it may be combined the use of the sinusoidal electric current. The medicinal treatment should consist in the administration of an alkaline bitter mixture with a little nux

vomica before meals, or an acid and nux vomica mixture after food (*see* STOMACH, DILATATION OF). Some writers recommend also the use of tincture of physostigmine in 10- to 15-min. doses twice or thrice a day as a muscle tonic. Carminatives may also be required from time to time for the relief of flatulence (*see* FLATULENCE). Lavage of the stomach should be avoided. If hyperacidity be present, 15 gr. of carbonate of bismuth or carbonate of magnesia should be added to each dose of the alkaline bitter mixture; whilst in cases of hypochlorhydria dilute hydrochloric acid should be given in 10-min. doses after meals.

3. The replacement of the stomach can only be partially effected in most cases, but the deposition of intraperitoneal fat and the restitution of the abdominal wall which the over-feeding and massage bring about, help to lift it up to some extent. Gastropexy, though sometimes recommended, is rarely if ever necessary; gastro-enterostomy should never be performed.

As the result of the four weeks' rest cure, combined with as much of the above special treatment as the complications present indicate, the patient should gain about 12 lb. in weight. She should then be fitted with a well-made abdominal belt, belt-corset, or other form of support, and may go away for a change of air. During convalescence and for many months after returning to ordinary life, however, one must insist upon abundance of rest, and especially upon lying down for half an hour after meals. The diet should continue to be abundant, and food should be taken between meals, but the amount of fluid taken at meals must be restricted. The practice of abdominal exercises may be continued with advantage, and the belt or surgical corset must be worn constantly. A further gain in weight of 10 lb. or more should be looked for in the first year after the rest-cure. In those cases in which the symptoms are not sufficiently severe to necessitate a rest-cure, or where the latter is impracticable, the treatment should consist in (1) An abundant but dry diet; (2) Lying down after meals; (3) Abdominal massage and exercises; (4) The use of an abdominal belt or surgical corset; (5) The administration of such drugs as are of use in atonic dyspepsia and in flatulence. (*See also* KIDNEY, MOVABLE.)

Robert Hutchison.

GENU-VALGUM.—(*See* KNOCK-KNEE.)

GIDDINESS.—(*See* VERTIGO.)

GLANDERS.—In the *acute* form of the disease, all that can be done is to deal with symptoms as they arise. Abscesses must be opened and drained, and treated antiseptically. The patient should be isolated, and those in attendance upon him should be very careful not to inoculate themselves with the disease.

In the *chronic* form, every effort should be made to get rid of the local lesions by excision and antiseptic applications. The nasal passages, if affected, should be washed out freely and frequently with antiseptic solution. Bendall recommends the internal administration of benzoate of soda at frequent intervals. Babes and Bonome advise the subcutaneous injection of $\frac{1}{20}$ to $\frac{1}{15}$ c.c. of mallein, at intervals of two or three days, for two months or so. After the early injections a reaction, local and general, follows; but after a time this does not occur. Such treatment is a form of vaccination. Lastly, a vaccine of dead *Bacillus mallei* has been tried in a few cases with some measure of success. It is very important to place the patient under the most favourable conditions as regards food, fresh air, etc. (*See also* SPECIFIC THERAPY.)

E. W. Goodall.

GLAUCOMA.—This is a condition of increased intra-ocular tension which is due to the eye containing too much fluid. It contains too much, because the fluid cannot get out of the eye. The fluid is secreted by the ciliary body, and normally should pass forwards through the pupil into the anterior chamber, through the angle of which it should get out of the eye by means of the canal of Schlemm. In every case of glaucoma there is some block in the circulation of this fluid. Thus, in primary glaucoma the block is due to apposition of the iris to the back of the cornea at the angle of the anterior chamber, so preventing the fluid passing into the canal of Schlemm; again, in iritis the pupil may become completely bound down to the lens, so that the fluid cannot pass from the posterior to the anterior chamber.

Before we can treat a case of glaucoma we must ascertain the exact cause of the increased tension, for in different cases the treatment may vary diametrically. Taking the above examples: in primary glaucoma, atropine, by dilating the pupil, will still further block the angle and may blind the eye, while eserine, by contracting the pupil, will tend to draw the iris away from the back of the cornea and relieve the tension; on the other hand, in iritis, with the pupil bound down to the lens, atropine, by breaking down the adhesions, may restore the circulation again and cure, while eserine, by contracting the pupil and increasing the congestion, will only make matters worse.

Primary Glaucoma (i.e., where there is no evidence of previous disease to account for the glaucoma).—

Diagnosis.—The chief difficulty in diagnosis occurs in distinguishing acute or subacute glaucoma from iritis.

In *glaucoma* there is increased tension. In *iritis* the tension is usually normal; but for those who cannot rely on their estimation of tension, there are other valuable points on which to base the diagnosis. In both these conditions there may be severe pain, both in the eye and radiating over the brow, some failure of sight, circumcorneal injection, and discoloration of the iris. But apart from the tension, it is the *pupil* which will in most cases give us the necessary clue.

In glaucoma the pupil is dilated—often pear-shaped. In iritis the pupil is contracted.

Other distinguishing points are the following:—

In *glaucoma* the onset is sudden, the pain severe, there is rapid loss of sight, often associated with vomiting, the circumcorneal congestion is a dusky purple, the anterior chamber is as a rule shallow, there are no spots of exudation on the back of the cornea, the iris is not bound down to the lens, there is generally a history of previous attacks of misty vision, with the appearance of coloured rings or halos round lights, possibly with some pain, which lasted a few *hours* and then passed off. In *iritis* the onset is gradual, the pain is less severe, there is no vomiting, and the loss of vision comes on slowly. The congestion is bright red, the anterior chamber is normal or deep, there are often spots of exudation to be made out (with a bright light and a magnifying glass) on the back of the cornea, or the pupil is in places bound down to the lens. If there have been any previous attacks of iritis, the failure in sight due to vitreous opacities, etc., will have lasted for *weeks*, not hours, and there will not have been halos. Halos are rarely seen except in glaucoma and in conjunctivitis; in this latter condition they are due to a film of mucus over the cornea. Examination of the other eye may reveal some signs either of glaucoma or previous iritis.

Treatment differs only in degree, according to whether the disease is acute, subacute, or chronic. In each, the cause of the increased tension is the blocking of the exit of the fluid of the eye at the angle of the anterior chamber by the apposition of the iris to the back of the cornea; our aim must therefore be to restore the circulation of the fluid in the eye, and so reduce the tension, either (1) By opening up the angle of the anterior chamber and so allowing the fluid to escape from the eye by the normal channels, by means of myotics or the performance of an iridectomy; or (2) By making some vicarious exit for the fluid by means of some form of filtering scar, such as trephining, sclerotomy, or Herbert's or La Grange's operation.

Myotics are very useful to reduce the tension in the acuter cases, and to tide them over till an operation can be performed, but as a rule they are to be looked upon as only temporary measures, and some operative treatment must be resorted to in order to bring about a permanent cure. The only exception to this is in elderly people with very chronic glaucoma: myotics may hold the glaucoma in check for years; but even here, if the field contracts, an operation should be done.

In addition to local treatment, it is very important to attend to the general health of the patient, especially with regard to lowering any increased blood-pressure, which should be measured in all cases. Diet should be restricted, especially in regard to meat and stimulants, the latter being avoided altogether when practicable. All kinds of mental anxiety should, whenever possible, be relieved, constipation avoided, only moderate use of the eyes allowed, and this with properly correcting glasses.

1. *Threatened Glaucoma.*—In the early stages of glaucoma—when only attacks of misty vision and halos have occurred—even though the vision is $\frac{6}{6}$, and there is no contraction of the field, as soon as the diagnosis is certain, a trephine or an iridectomy should be done at once. One never knows how severe the attack may be when it occurs, and how much it may impair the sight. Cases operated on early do exceedingly well. It is a great mistake to postpone operation till the vision has definitely begun to deteriorate. This is especially true where one eye has had an acute attack, or is blind from glaucoma, and the good eye has begun to show symptoms. The good eye should be operated on without

delay. Some surgeons regularly advise operation in both eyes, even though the symptoms have occurred only in one.

Until the operation takes place, the pupil must be kept contracted with eserine, 1 or 2 gr. to the ounce, instilled three times a day. The weakest eserine that will keep the pupil contracted should be used, and it may be combined with cocaine, in the proportion of 1 of eserine to 3 of cocaine.

2. *In an Acute or Subacute Attack*, treatment must be prompt and energetic; every hour of increased tension may cause irreparable damage to the retina and optic nerve. On the other hand, the reduction of tension must not be too sudden. It is much better to reduce the tension by eserine and leeching before operating, so that the fall of tension at the time of operation may be as little as possible; otherwise some retinal or choroidal vessel may give way, and an intra-ocular hæmorrhage occur, which will cause complete loss of the eye.

The patient should be in bed, two leeches applied to the temple, and eserine drops (3 or 4 gr. to the ounce *) instilled every quarter of an hour for the first hour, and later every hour, until the tension falls.

A purgative should be administered, and, if necessary and not otherwise contra-indicated, an injection of morphia—to give the patient some much-needed sleep. Stimulants should be avoided as far as possible, unless there is much collapse, when they must be given. If the tension comes down, it is better to postpone operating for at least twenty-four hours, to allow the patient and the eye to recover from the shock of the acute attack, the eye meanwhile being kept under the influence of eserine. The operation is then performed under the most favourable conditions. If, however, in spite of the above treatment, the tension has not come down after about six hours, an operation must be performed forthwith.†

Iridectomy is still the operation usually preferred in acute glaucoma, and gives excellent results, though some surgeons prefer trephining even for these cases.

Patients who have had one acute attack and have got over it, should have an operation performed without delay; since, if this is not done, a return of the tension is bound to occur, and may possibly happen at a time when the patient has no eserine to use, and is away from skilled aid, with the result that the vision may be seriously impaired, or even lost. The risk of the operation in skilled hands is less than that of leaving the eye alone. (*Vide infra.*)

3. *Chronic Glaucoma.*—It is in this group of cases that most surgeons, at the present time, prefer trephining to iridectomy, and especially in the most chronic cases (glaucoma simplex), in which the tension may never be found to be definitely raised, and no attacks of mists or halos are complained of; iridectomy, though it sometimes succeeds, does not hold out the same satisfactory chances of success as it does in the more acute forms, while trephining is often successful. As mentioned above, there are certainly cases where myotics alone (eserine or pilocarpine) have kept the field and acuity of vision practically unimpaired for years; but on the other hand, many treated in this way are seen in which either the drops are not used regularly, or a very troublesome eserine irritation is set up; or again, the myotic does not keep the disease in check, and the sight goes from bad to worse: so that in most cases it is safer to perform an operation as soon as possible.

Warning.—Before an operation is performed, it should be explained to the patient in most cases: (*a*) That there is a certain amount of risk in the operation. (Eyes have been lost from an intra-ocular hæmorrhage—to mention only one unavoidable accident); (*b*) Glasses will have to be worn after operation, to correct the astigmatism (though this is slight in the case of trephining); (*c*) Vision, except in the acute cases, will probably not be improved—*it may be slightly worse*, owing to the astigmatism, and the dazzling due to the irregular pupil. But these considerations are quite overbalanced by the fact that, if left alone, the eye will go blind; whereas the operation will probably save the sight for the rest of the patient's life.

Trephining is not so simple an operation as it is sometimes described, but is now

---

* Sometimes eserine drops, 4 gr. to the ounce, cause very severe pain; if this persists, weaker drops (2 gr.) must be substituted.

† Before doing the iridectomy in these cases, the tension should be first lowered by a posterior sclerotomy.

looked upon as the most satisfactory remedy. There are many complications which may arise during the operation itself; and even if to all appearances perfectly done, the tension sometimes returns, or a troublesome iritis is set up which may materially impair the sight, to mention only two of the commoner troubles. For details of the operation, see ophthalmic text-books.

The care of a case which has been trephined is much the same as after iridectomy (*vide infra*). The only difference is that it is well to keep the pupil of the operated eye well dilated with atropine till all signs of redness have disappeared, in order to prevent iritis.

Trephining is, as a rule, a very successful operation; it leaves little or no astigmatism, the small button-hole iridectomy causes no dazzling, and if the tension is not relieved the operation can easily be repeated.

Iridectomy for glaucoma is a highly specialized operation. When the anterior chamber is very shallow, the incision becomes one of the most difficult procedures in ophthalmic surgery. If the knife goes too deep, it may easily pass through the iris and prick the lens, causing traumatic cataract, and generally loss of the eye; if it does not go deep enough, the cornea is tunnelled, and the anterior chamber is not reached. Again, the cutting of the iris does not consist in simply cutting off any portion of iris that may be grasped in the forceps; unless the iris is properly and freely torn away from its root, and the angles carefully replaced, the probability is that the operation will fail. Hence the importance of the operation being undertaken only by a surgeon skilled in ophthalmic practice. For details of the operation, see ophthalmic text-books.

Management of a case of Iridectomy.—There must be complete rest in bed for from five to six days, with strict nursing, the patient not being allowed to sit up till after the fourth day. Both eyes are bandaged for three days; after this the unoperated eye may be freed. A drop of eserine solution (2 gr. to the ounce) is instilled into the unoperated eye both at the time of the operation and daily for at least a week afterwards, to prevent an attack of glaucoma being induced in this eye.

The operated eye is dressed every day; warm boracic lotion is used to wash away any discharge from the lashes and lids, and a little allowed to pass into the conjunctival sac; great gentleness and strict antiseptic precautions must be exercised.

If no pain is complained of, no extensive examination of the wound is made until the fourth day. If the wound is flat, and the anterior chamber has re-formed, the bandage may be dispensed with during the day at the end of the week, dark glasses being worn; but a pad and bandage must be used at night for at least another week.

Complications.—If the anterior chamber does not re-form, the patient must be kept longer in bed. If the wound tends to gape, the bandage must be worn for longer than a week. If iritis or cyclitis supervenes, leeching to the temple and hot bathing should be used. If the wound bulges, and the lens presents, the lens must be removed.

When iridectomy fails to relieve the tension, eserine drops (2 gr. to the ounce) are given. If the tension still remains too high, trephining or one of the other forms of sclerotomy should be performed, and this can be repeated if unsuccessful at the first attempt. Very gentle massage of the eye by the patient himself, for three or four minutes twice a day, is effective in some cases.

If eserine causes irritation (conjunctivitis and eczema of the lids), nitrate of pilocarpine (2 to 4 gr. to the ounce) should be substituted: pilocarpine is less powerful but not so irritating as eserine. The skin of the lids should be treated with zinc oxide or calamine ointment, and the conjunctiva with a lotion of boracic acid (10 gr.) and zinc sulphate ($\frac{1}{2}$ or 1 gr. to the ounce).

Blind and painful glaucomatous eyes should be excised.

Secondary Glaucoma (i.e., where the glaucoma is secondary to some other disease).—

1. *Iritis* is occasionally complicated with glaucoma (*see* IRITIS):—

a. When the margin of the pupil is completely bound down to the lens (complete annular synechia), the fluid secreted by the ciliary body, being unable to pass through the pupil, collects behind the iris and balloons this forwards (*bombé* iris). Our object in treatment must be to restore the circulation of fluid, either by breaking down the adhesions with atropine, or, failing this, by making some opening in the iris by iridectomy or quadruple puncture.

Atropine ointment (4 gr., or, if not strong enough, 8 gr. to the ounce) combined with cocaine (10 gr. to the ounce) is used every half-hour for the first three hours, and later, four to six times a day, combined with leeching to the temple, hot applications to the eye, and a brisk purge. If atropine fails to break down the adhesions and thus reduce the tension, some operation must be performed. When there is severe iritis a 'quadruple puncture' is indicated,* to be followed later, when the eye is quiet, by an iridectomy. In the more chronic cases, iridectomy may be performed with a good chance of success.

b. When the pupil is not bound down to the lens, and the anterior chamber is deep, the increased tension being due to the blocking of the filtration area by inflammatory exudates, the tension must be met with leeching, purging, and atropine (but atropine in these cases must be used sparingly, just sufficient to keep the pupil moderately dilated). If this fails, paracentesis of the cornea must be performed, and this can be repeated several times, if necessary.

2. *Glaucoma frequently follows Wounds of the Cornea, or Perforation of a Corneal Ulcer, when the pupillary margin of the iris becomes included in the corneal opening.* An iridectomy must be performed as soon as the conjunctival sac is clean.

3. *Wounds of, or Operations on, the Lens* may cause glaucoma, quite apart from any iritis which the trauma may have produced. After needling the lens, or after accidental wounds, the soft lens matter may either block the pupil or collect in the anterior chamber, and thus give rise to increased tension. The treatment consists in keeping the pupil dilated with atropine, and letting out the soft lens matter by a curette evacuation. Sometimes a tag of lens capsule becomes adherent to the corneal wound after needling, or after extraction of cataract, which by dragging on the iris causes glaucoma. Eserine should be tried first; but if this fails, the capsule should be divided with a cutting needle.

4. *Dislocation of the Lens* may cause glaucoma. (*a*) Dislocation into the anterior chamber. Eserine must not be given, but the lens should be extracted. (*b*) Lateral dislocation. Eserine should be tried, and, if it fails, trephining or iridectomy and removal of the lens with the scoop should be carried out. (*c*) Dislocation into the vitreous. In this case the lens cannot be removed. If eserine fails, trephining affords the best chance of saving the eye in this very hopeless condition.

5. *Glaucoma associated with Detachment of the Retina.*—Whenever this occurs, we must examine carefully for evidence of *intra-ocular new growth.* Even in doubtful cases the eye should be excised without delay.

6. *Glaucomatous Eyes associated with Cataract, and no Perception of Light,* should be suspected of new growth, and excised.

Buphthalmos (Glaucoma occurring in childhood causing enlargement of the whole globe).—The glaucoma may be primary or secondary. Where primary, trephining, Herbert's or La Grange's operation with or without iridectomy, or a sclerotomy, holds out the best chance of retaining vision, and should be done as early as possible. Where secondary, cases should be treated on the lines mentioned above. *W. Tindall Lister.*

GLÉNARD'S DISEASE.—(*See* GASTROPTOSIS.)

GLYCOSURIA.—(*See also* DIABETES MELLITUS.) Transient glycosuria requires no treatment other than that which is indicated for the disease with which it is associated. Permanent glycosuria such as is met with in elderly, gouty, obese, or alcoholic subjects cannot be clearly distinguished from true diabetes, and must be treated on the same lines as the latter (q.v.). In the majority of instances it will be found that such cases belong to the alimentary type, and have some tolerance for carbohydrates; they should, therefore, be dieted in the same way as mild cases of true diabetes. Seeing, however, that alcohol undoubtedly plays a part in the production of some cases of glycosuria, it should always be banished from the diet. Spa treatment agrees well with such patients: Carlsbad, Vichy, and Neuenahr being the most suitable places. The same drugs may be tried as in true diabetes.

For the treatment of the most common complications (ECZEMA, CARBUNCLE, GANGRENE, CATARACT, etc.), see special articles. *Robert Hutchison.*

* If iridectomy is performed in the presence of acute iritis, the coloboma will probably be filled up with lymph, and a more severe, possibly a disastrous, iridocyclitis is liable to be set up.

GOITRE, EXOPHTHALMIC.—In exophthalmic goitre the best results are to be obtained by a judicious combination of hygienic measures with radiotherapeutic, electrical, and medicinal treatment.

The hygienic treatment consists mainly in regulating the amount of rest, exercise, feeding, and fresh air suitable for each case. In very severe cases, at the commencement of the treatment of cases of moderate severity, and during the acute exacerbations which may occur in any case, complete rest in bed is essential. It may be continued for from two to six weeks or longer, according to the severity of the symptoms and the progress made. The rest should be combined with feeding on a generous diet, consisting chiefly of milk, carbohydrates, and fats, regulated in amount by the degree of emaciation which has taken place. The quantity of milk to be taken in different cases may thus vary from 2 to 6 pints in the twenty-four hours. Red meat should be allowed very sparingly, if at all. In carrying out this modified 'rest-cure', it is not generally advisable to isolate the patient.

With patients who are able to go about, and who have already been treated by complete rest, it is most important to regulate the mode of life. Twelve hours' rest in bed at night is required, from ten to ten being a convenient time. In some cases, an additional rest for half an hour to an hour after lunch, and before dinner in the evening, is advisable. A quiet life in the country is most suitable, and should be recommended when possible. It is a great advantage if the larger part of the day can be spent resting out of doors or in an open-air shelter. A dry, bracing, inland climate is the most suitable. Marine climates should not be recommended, as in many cases the symptoms are aggravated by a visit to the seaside or by a sea-voyage. All undue excitement, and over-exertion, must be sedulously avoided. As exophthalmic goitre not infrequently occurs in young women of much natural ability, who are leading an active and useful life, it is necessary in each case to give exact directions as to what may or may not be undertaken. Walking is the most suitable form of exercise, but the pace should be limited to two miles an hour, and the distance regulated according to the effect which the exercise produces upon the pulse-rate. The more active movements entailed by cycling, dancing, riding, or playing tennis, are unsuitable, and quicken the pulse far too much. Uncongenial social duties, concerts, theatres, and large gatherings of people, are all unsuitable for these cases.

Radiotherapy.—By the continued use of x rays or radium we endeavour to induce atrophy of the redundant secreting cells and to stimulate the development of an interalveolar fibrosis, so as to reduce the abnormal activity of the thyroid gland. X rays must be passed through a suitable filter of 3 mm. of aluminium and a layer of boiler felt, so that only the β and γ rays pass through to the gland. As a rule one to one-and-a-half Sabouraud units, measured on the same side of the filter as the tube is placed, should be given at each sitting. This dose may be given twice a week at first and once a week later on. In some cases a course of three or four months will suffice, in others the treatment may have to be continued for one or even two years. In the majority of cases gradual, and in some rapid, improvement takes place.

Radium treatment yields results similar to those obtained by the use of x rays, but rarely an application has been followed by acute and fatal hyperthyroidism. The longer intervals which are allowed between each application make this treatment more suitable for those who reside at a distance from a place where radiotherapy is available. At the Manchester Radium Institute the usual practice is to apply radium emanation plates of a strength of 2·5 mgrm. or millicuries to the square centimetre over the thyroid gland. The plates are of such size that 45 to 76·5 mgrm. are applied each time, screened by 1·5 mm. of lead. They are applied for twenty-four consecutive hours every six weeks. This treatment may be continued for one or even two years in some cases.

Electrical Treatment.—A very useful method of treatment, especially when x rays are not available, is by the prolonged daily application of a moderate faradic current to the neck. Two flexible electrodes, some four inches long and two wide, are applied, the one over the goitre in front and the other at the back of the neck, and fixed in position by means of straps and buckles at the sides. These are connected with the secondary circuit of a dry-cell faradic battery, a water rheostat being included in the circuit, so that the strength of the current can be modified as desired. The current, which should be just strong enough to produce a prickling sensation in the skin, may be applied from one to

two hours morning and evening. This treatment should be continued steadily for from six to twelve months. The patient readily learns how to use the battery, and is then able to carry out the treatment without difficulty in her own home. (*See also* ELECTRO-THERAPEUTICS.)

Medicinal Treatment.—A large number of drugs have been employed in the treatment of exophthalmic goitre; only a certain number of these have been of any real service, some in the routine treatment of the malady, others in the alleviation of the special symptoms.

One of the most useful drugs is arsenic, which may be given in nearly all cases with advantage. The best results are obtained by small doses continued over a long period with regular intermissions. As a rule 3 to 5 min. of liquor arsenicalis given thrice daily after food will suffice. It is a good plan to omit the arsenic for one week in each month, but to continue the treatment in this manner for from six to twelve months. Belladonna has been found to do good by many, but patients often object to taking it continuously in sufficiently large doses, owing to the discomfort produced when its physiological effects are felt. Sodium phosphate has been strongly recommended by some observers, in doses of from 15 to 60 gr. three times a day. In cases in which the pulse-rate is high, tincture of convallaria may be given in combination with one or other of the above drugs, in 10- to 15-min. doses, as it appears to have a better effect in reducing the frequency of the pulse than the other cardiac tonics. Where there is marked dilatation of the left ventricle with relative mitral incompetence, digitalis or strophanthus may be used with, or instead of, the convallaria. When nervousness is a specially marked feature, potassium bromide may be given in 10- to 15-gr. doses for a time. Suprarenal and thymus tablets (5-gr.) have appeared to do good in some cases. Iodine should not be given internally in any form, as it is apt to increase the secretory activity of the thyroid gland. Thyroid extract should of course never be employed, as it only aggravates the symptoms.

Urgent special symptoms at times require treatment. Sudden attacks of diarrhœa should be treated by rest in bed, a milk diet, and the administration of laudanum (5 min.) with dilute sulphuric acid (15 min.) in a mixture three or four times a day. Vomiting is a serious symptom, and sometimes persists, in spite of all treatment, until the patient dies from exhaustion. Morphine, given either hypodermically or in a suppository, is the most efficient drug in the treatment of this kind of vomiting. In some cases, hypodermic injections of pituitary extract have checked the vomiting. In severe cases, rectal injections of 3 oz. of water containing sodium bicarbonate (30 gr.) may be given every two or three hours. Very severe attacks of palpitation are most promptly relieved by the application of cold, in the form of an ice-bag to the præcordium.

Serum Treatment.—Various endeavours have been made to prepare an antitoxic serum which would neutralize the toxæmic condition due to the excessive thyroidal secretion. In one direction it was assumed that, after removal of the thyroid gland, certain substances, which would normally have been destroyed by the thyroid secretion, accumulated in the blood, and that this blood, or a serum prepared from it, might be used conversely, as antidote to the excess of secretion present in exophthalmic goitre. Ballet and Enriquez employed the serum of dogs from which the thyroid gland had previously been removed. Moebius made use of a serum obtained from the sheep several weeks after thyroidectomy, and reported favourably upon the results obtained by giving it in 5-min. doses three times a day. This serum is sold under the name of 'antithyroidine'. Some observers have reported favourable results from its use. Lanz, following up the same idea, has advocated the use of the fresh milk of a goat from which the thyroid gland had previously been removed. He obtained good results in six cases. The whole of the milk of one goat should be consumed by the patient in the twenty-four hours. When it cannot be obtained fresh, the dried milk, which is sold under the name of 'rodagen', may be used instead, and good results have been reported after taking it in ½-drachm doses thrice a day. The dried blood of an animal from which the thyroid gland has been removed, which is sold under the name of 'thyroidectin', may be given in 5-gr. doses in a capsule three times a day. Good results have been obtained in some cases. Attempts have also been made to produce a serum which is thyrotoxic; that is to say, capable of bringing about destructive changes in the hypertrophied thyroid gland by a process of cytolysis. To this end, preparations of the thyroid gland of man or an animal have been

injected into another animal, in the hope that in this way specific cytolysins might be produced in its serum. Serum prepared in this way has not proved to be of any special service.

In conclusion, it may be stated that at the present time the best results are obtained by a combination of general hygienic treatment with the use of *x* rays, radium, or electricity, and certain drugs as described above, and that as yet no serum or other animal product has been found to give uniformly better results than these.

Surgical Treatment. (*See also* separate article.)—Cases of exophthalmic goitre bear all operations badly, and the mortality after operations upon the thyroid gland in this disease has been high in this country. Recent improvements in the method of inducing anæsthesia, and the adoption of the principles of anoci-association, as recommended by Crile, have diminished the risk of operation in these cases in which nervousness is such a prominent symptom. Thus, Prof. Kocher has operated on 469 cases of Graves' disease, with a total mortality of 3·4 per cent. In mild cases no operation is required, as the prospects of recovery under medical treatment are good. In severe cases no operation is advisable unless medical treatment fails after a fair trial. It is in selected cases of moderate severity, with no serious cardiac disease, and in the industrial classes especially, that operative treatment may be recommended. The most simple procedure appears to be to ligature the blood-vessels and the nerves of the superior pedicle, first on one side, and then, after an interval, on the other, so as to exclude nerve influence and diminish the blood-supply to the goitre. When subsequently a partial thyroidectomy is carried out, it is important to remove not less than three-fourths of the gland. In some cases complete recovery has resulted, and in others marked improvement. *George R. Murray.*

GOITRE, SIMPLE PARENCHYMATOUS.—In certain cases of simple parenchymatous goitre occurring in young adults, much may be done by medical treatment in the early stages. In cases of long standing, and in those in which much fibrous tissue has developed, medical treatment has little if any effect, and if the goitre is large or causes inconvenience by pressure, a portion of it should be removed by operation. The favourable cases for medical treatment are those of simple parenchymatous goitre, which not infrequently occurs in adolescents and young adults. It is probable that this growth of the gland is a true hypertrophy which occurs in response to some demand for an increased supply of its secretion. In some cases, however, it appears as if the hypertrophy, once started, goes on increasing until it surpasses physiological limits, becomes pathological, and does not subside without special treatment. If, in these cases, we give thyroid extract, we satisfy the demand for an increased supply of thyroidal secretion from an external source, so that the gland is able to rest and undergo a partial atrophy, with a corresponding diminution in size.

In selecting cases for this treatment, it is important to make sure that no symptoms of hyperthyroidism are present, such as frequent pulse, tremor, or nervousness, which would only be aggravated by thyroid treatment. In carrying out the treatment, it is advisable to begin with small doses. From two to five grains of dry thyroid (thyroideum siccum B.P.) may be given each night at bedtime, either as a powder or tablet. In many cases this daily dose has proved quite sufficient, in others it is necessary to increase it to twice, or even thrice a day. As long as the pulse is not accelerated more than fifteen or twenty beats a minute, this dose may be continued. In a favourable case, the diminution in the goitre takes place rapidly; thus, in one of my cases the circumference of the neck diminished 3½ in. in less than three months. By this treatment the goitre may be reduced to two-thirds, one-half, or one-third of its former size, or it may entirely disappear, and the symptoms caused by its presence are relieved, or removed altogether. In some cases the goitre may develop again when the treatment has been discontinued for a few weeks or months. When this occurs the size can be again reduced by a second course of treatment.

If the patient is living in a goitrous district, he should leave it, if possible, for a time. If this is not possible, careful attention must be paid to the character of the drinking water. The active agent in the causation of endemic goitre has not yet been isolated, but McCarrison has shown that fæcal contamination of food and drink is an important factor in its production. Every care must therefore be taken to eliminate this cause, and all drinking water should be either distilled or sterilized.

Iodine, in one form or another, has long been used with success in the treatment of simple goitre. Thyroidal secretion contains iodine in an organic combination described as thyroiodin by Baumann ; so that the action of iodine in these cases is probably supplemental, like that of thyroid extract. Thus, potassium iodide 5 to 10 gr., or weak tincture of iodine 5 min., or a combination of both, may be given three times a day.

In the treatment of endemic goitre, McCarrison recommends the use of intestinal antiseptics. Ten grains of thymol may be given as a powder, followed by a drink of water, night and morning. As all solvents of the drug must be excluded from the dietary, it is more suitable for Indians than for Europeans. Full doses of salol or β-naphthol may be given instead two or three times a day.

In the simple form of parenchymatous goitre, the application of a blister, by painting the skin over the goitre with liquor epispasticus, is often useful. In most cases, however, counter-irritation by the inunction of the red iodide of mercury ointment is more suitable. Sometimes this ointment is too strong ; it should then be used from a quarter to half the usual strength, that is to say, 5 to 10 gr. red iodide of mercury to 1 oz. benzoated lard, applied in small quantity each night, or even every other night. Tinct. iodi mitis, iodine ointment, or a mixture of one part of it with two of potassium iodide ointment, may be applied instead. The efficiency of the red iodide of mercury ointment is increased by exposing the skin to the rays of the sun after its application ; especially is this so in a tropical country, such as India.

Neither radium nor *x* rays have proved to be beneficial in the treatment of this form of goitre.

At one time injections of iodine into the goitre were employed. It is to be hoped, however, that this treatment has now been finally abandoned ; it is dangerous and uncertain, no fewer than sixteen cases in which death had occurred in consequence of the injections having been collected by Heymann. Sir Victor Horsley has shown by experiment that death in such cases is due to the iodine being injected directly into a large blood-vessel, an accident which it is difficult to avoid on all occasions in the case of such a vascular stricture as a goitre.

In goitres in which adenomata or cysts are present, some diminution in size may follow a course of medical treatment, as a result of changes in the gland in which they are embedded. Adenomata and cysts are not affected by any known medicinal or radiotherapeutic treatment, so that removal by operation is indicated as soon as any pressure symptom or inconvenience arises. (*See also* GOITRE, SURGICAL TREATMENT.)

George R. Murray.

GOITRE (Surgical Treatment).—Certain diseases of the thyroid body can be dealt with only by operation, while other diseases are susceptible to medical treatment—which again may sometimes need to be supplemented by operation. It is therefore necessary that a clear conception should be obtained of what precisely can be attained by operative treatment, and of how that treatment produces its effect.

THE SCOPE OF OPERATIVE TREATMENT.

The following is a list of the various modifications in thyroid conditions which can be effected by operation. Used with a knowledge of the selection of suitable individual cases, the list will serve as an enumeration of the *indications for operative treatment.*

1. The relief of deformity due to large but symptomless goitres.

2. The relief of local symptoms due to pressure on structures adjacent to the thyroid.

3. The removal of localized foci of disease which, though possibly symptomless, would by their continued growth ultimately cause serious symptoms. Such localized foci of disease include :—

a. Localized encapsuled masses of colloid degeneration, single or multiple, cystic or solid, and usually described clinically as 'thyroid adenomata'.

b. True adenoma of the thyroid—a benign glandular tumour.

c. Malignant tumours, sarcoma or carcinoma, but usually the latter.

4. The relief of hyperthyroidism accompanying disease—usually localized—of the gland.

5. The control of generalized diseases of the gland substance—viz., parenchymatous (colloid) degeneration, and Graves' disease.

6. The relief of hypothyroidism by thyroid grafting.

Some comment on each of these classes is necessary.

1. **Deformity.**—Very large goitres, mainly or wholly cystic as a rule, and occurring in middle-aged or elderly persons, should be removed even if there is no other indication than the very repulsive deformity. The operation under these circumstances is almost always easy and safe. If, however, there is any evidence of hypothyroidism, the operation should not be advised unless it is clear that the goitre contains no functional thyroid tissue, as for example where it is entirely cystic.

2. **Local Pressure Symptoms.**—*Pressure on the veins* at the root of the neck or in the thorax is common, and may cause distention of the veins above the disease, cyanosis of the face, dizziness, and headaches. Some patients seem to be especially sensitive to slight degrees of venous congestion of the brain and meninges, and in them the headaches are severe.

Pressure on nerves is relatively common. Malignant disease tends to involve the recurrent laryngeal early and the sympathetic later. In advanced inoperable malignant disease the vagus and the roots of the brachial plexus are also affected. The only nerve affected by non-malignant conditions is the recurrent. It is a mistake, in the absence of other signs, to suppose that recurrent paralysis is conclusive, or even very strong, evidence of malignant disease.

Pressure on the visceral structures of the neck (trachea and œsophagus) is very common, and most important. Lateral compression of the trachea is usual. If the goitre is unilateral, the trachea is in addition displaced to the opposite side, sometimes to such an extent that the displaced larynx may be mistaken for an enlarged gland or another tumour. When the goitre is placed far back, or in the thorax, severe dyspnœa may suddenly come on in a patient previously supposed to be quite well. Usually, however, some shortness of breath is noticed by the patient from an early period. Intrathoracic goitre pressing on the trachea, and possibly even on one or other main bronchus, causes a condition which may be regarded and tolerated by the patient as 'chronic asthma'. There may be little or no goitre showing in the neck, though the true state of affairs is at once disclosed by a radiogram of the thorax.

Pressure on the œsophagus, as might be expected, is not commonly a cause of definite obstruction, since unless the goitre be situated in the middle line and behind the sternum, anteroposterior pressure is not marked. A general discomfort and stiffness in swallowing is often complained of, from limitation of the vertical movements of the trachea which accompany the act. In malignant disease this fixation becomes very marked, and ultimately actual obstruction is common.

Local pressure symptoms of any kind may generally be regarded as an absolute indication for operation if the condition is such as to be amenable to operative treatment. The conditions usually calling for treatment under this indication are localized colloid masses, cervical or intrathoracic; true adenomata; and early malignant disease.

3. **Thyroid 'Tumours'.**—The term tumour is used here in a clinical sense, and includes some conditions which certainly are not true neoplasms, but which are still often described as adenomata.

a. The localized, and more or less distinctly encapsuled, colloid mass is undoubtedly the commonest of the three main varieties of localized thyroid swelling already mentioned above.

b. True adenoma of the thyroid, that is, a benign epithelial neoplasm, is a comparatively rare tumour. There is usually difficulty in distinguishing it from the carcinomata, and it occurs either as a solid, firm tumour consisting of alveoli filled with cells, or as a cystic tumour with intracystic growths.

c. Malignant disease of the thyroid is not very uncommon. It is not possible here to enter upon the very numerous histological forms in which the disease appears. In the great majority of cases it is a carcinoma of some kind. Sarcoma is comparatively rare. Carcinoma affects the glands of the posterior triangle early, so that a gland operation is always necessary in the treatment. The disease appears as a hard localized mass in the substance of the gland, and a certain diagnosis can scarcely ever be made in

operable cases, and should not be expected. The sinister reputation of carcinoma of the thyroid is probably to a great extent due to the fact that it is usually regarded as capable of diagnosis before operation.

Indications for Treatment.—*A localized mass in the thyroid should invariably be excised, whether it is causing symptoms or not.* The chief reason why this principle can be laid down so dogmatically is that such a swelling will almost invariably increase in size, and ultimately produce symptoms at a time when it is more difficult to remove. It must be remembered, moreover, that malignant disease also begins as such a localized symptomless mass, and, at a time when it still remains curable by operation, cannot be distinguished clinically from a simple adenoma or a localized colloid tumour. Malignant disease may be suspected when a localized mass which has remained quiescent in the thyroid of a middle-aged person for some time, possibly years, begins to increase in size and hardness, and to lose its well-defined outline. In the later stages, when nerve-involvement is present and the thyroid gland itself begins to be fixed to surrounding parts, the diagnosis becomes more sure, but the treatment incomparably less hopeful. Involvement of the cervical lymph-glands, contrary to what is frequently thought, is not a very unfavourable complication in malignant disease, provided an adequate gland dissection of the modern type is carried out. Experience also shows that a total extirpation of the thyroid gland is not essential for the cure of malignant disease. In rare cases, it is true, multiple nodules of carcinoma are found in the gland ; but such an occurrence is so uncommon as not to justify the very serious operation of total thyroidectomy as a routine treatment of malignant disease. In elderly or old patients the operation may produce no grave disturbance, and may sometimes be advisable ; but carcinoma is not uncommon at about the age of forty, and in such patients it is usually very difficult, if not impossible, to establish satisfactory compensation by thyroid feeding or thyroid grafting.

A clinical picture closely resembling that of malignant disease of the thyroid is produced by certain cases of carcinoma of the œsophagus in which the disease has spread at an early period into the lateral lobe and produced a firm swelling of the thyroid, gradually extending from behind forward. In such cases recurrent paralysis and thyroid swelling are early signs, while dysphagia may be late or absent. It is a very serious error to operate on a case of this kind, as the operation cannot be completed, and an œsophageal fistula, with infection of the tissues of the neck, is almost certain to result.

In advanced colloid degeneration, a part or even the whole of the gland may be occupied by more or less distinct rounded masses, which are sometimes described as multiple adenomata. In such cases operation should always be advised. It may not, however, be possible to remove all the swellings by an operation of less extent than a total thyroidectomy. This is rarely, if ever, justifiable. The best course is to remove the lobe most affected, and to enucleate such other nodules of disease as are accessible.

Radiography in the Diagnosis of Thyroid Disease.—This method of examination is so important that it deserves special mention ; whenever there is any doubt as to the nature and extent of the disease it should be regarded as a necessary preliminary to operation. By it the exact form and situation of the trachea can usually be defined, and the presence of a more or less completely intrathoracic goitre detected. It is not possible to enumerate here the various aids to diagnosis that may be derived from *x*-ray examination, but it may be mentioned that when a deep-seated nodule in the thyroid causes an abrupt and localized bulging into the trachea, malignant disease may be suspected.

4. The Relief of Hyperthyroidism.—Certain cases of thyroid disease (almost always colloid degeneration) develop a peculiar group of symptoms, including tachycardia, palpitation, tremor, nervousness, wasting, and general weakness. These symptoms resemble those produced by the administration of thyroid extract, and are regarded as being due to the thyroid secretion reaching the patient's blood in excessive amount, though of normal quality. These cases have sometimes been regarded as larval or incomplete forms of Graves' disease. The clinical condition is a well-marked one, and in the great majority of cases is easily distinguishable from Graves' disease. The thyroid contains one or more rounded masses of colloid degeneration, well defined and easily palpable, in the substance of the gland, and there is little evidence of the local arterial dilatation and excessive pulsation so characteristic of the generally-enlarged gland of Graves' disease. Moreover

the symptoms do not include the more serious and characteristic manifestations of the latter, such as exophthalmos, progressive course, and liability to acute attacks with fever, vomiting, and diarrhœa. It must be admitted that an exact differentiation between the two conditions is difficult in a description, because isolated symptoms not usually present in hyperthyroidism may occasionally appear in it and challenge the validity of an absolute rule. Nevertheless, those familiar with the two conditions will find no difficulty in making the distinction in the great majority of cases. It is useful to remember that mild cases of Graves' disease are usually quite as characteristic as severe ones, and do not approximate to the type of hyperthyroidism ; and that exophthalmos, although opinions to the contrary are frequently expressed, is almost invariably present in Graves' disease. The diagnosis of these two conditions is extremely important, and must always be carefully considered, because their amenability to treatment is so different. Hyperthyroidism due to a single localized colloid mass can almost certainly be cured by the removal of the latter by an operation easy to carry out and free from serious danger. In some comparatively rare cases hyperthyroidism occurs as a complication of widespread and active colloid degeneration. In these cases, and especially in relatively young patients, although relief follows partial resection of the enlarged gland, the swelling and the toxic symptoms are apt to recur. Under such circumstances, a second partial thyroidectomy may be undertaken ; but care should be taken not to reduce the residue of the gland too much.

5. **The Control of Generalized Disease of the Gland.**—There are two diseases of the gland which tend to become generalized throughout its substance—parenchymatous (colloid) goitre, and exophthalmic goitre (Graves' disease). The course of both can be directly influenced by surgical treatment.

Parenchymatous Goitre.—In its earliest stages this has some of the features of a physiological hypertrophy, and usually subsides spontaneously or as the result of medical treatment. Supposing, however, such treatment to be ineffective, there is a further resource in operation. The progress of the disease can usually be arrested, and subsidence brought about, by a partial removal of the gland. If any harder nodule can be felt, the part of the gland chosen for removal should be that containing it. It is clearly to be understood that the object of the operation is to check the progress of the disease, so that the indications for it are independent of the existence of symptoms, and are based on the persistence of a large parenchymatous goitre in spite of medical treatment. It is not known how the operation produces its effect, but it is remarkable how large a goitre will rapidly disappear after the excision of a comparatively small fraction of its substance.

Exophthalmic Goitre.—In attempting to define the scope of operative treatment in exophthalmic goitre, it is necessary to review some of the pronounced features of the disease. There can nowadays be little doubt that the primary cause of all the symptoms is the abnormality of the thyroid. The essential change in the gland is hyperplastic in type, but the newly-formed tissue differs strikingly in appearance from normal thyroid tissue, and produces a secretion which is not only excessive in amount but also abnormal in quality and highly toxic. It is important to remember that, side by side with the hyperplastic changes, destructive changes are going on in scattered foci throughout the gland, so that considerable tracts of the gland substance are ultimately replaced by fibroid tissue. Variations in these destructive changes are the chief differences to be seen in sections from goitres from different cases and of different degrees of enlargement.

The disease is capable of spontaneous recovery, usually after a course of several years. Recovery generally leaves the gland abnormally fibrotic, and sometimes permanently enlarged and hard.

A considerable number of patients—perhaps about 10 per cent—die of the disease ; of those who survive, all are totally incapacitated during the acute attacks, and some throughout the whole course ; of those in whom the disease becomes quiescent, many will have sustained damage to the heart ; while, finally, recovery may be accompanied by the appearance of hypothyroidism or definite myxœdema. It is not unusual in long-standing cases to find the symptoms of early myxœdema side by side with those of Graves' disease.

It follows from the foregoing that, even if the mortality accompanying operative treatment were not much less than that of the untreated disease, such treatment would have a great deal to recommend it if it were efficient in arresting so distressing and

burdensome a malady. Though doubtless many lives have been saved by the operation —and the operative mortality of the most experienced surgeons is about 5 per cent or less—it will probably not be until operation becomes a routine treatment in early cases that it will effect any gross reduction in the total death-rate from the disease.

Medical treatment is admittedly directed to the relief of symptoms, and cannot be regarded as having any effect on the duration of the disease. The only methods of acting directly on the thyroid are radiotherapy and operation.

The disadvantage of *x*-ray treatment seems to be that its effect, when any is produced, is purely destructive, and not selective for the diseased process. Consequently there is a certain risk of carrying the action too far and producing thyroid insufficiency.

The operative measures which may be used are ligature of vessels and partial thyroidectomy. Ligature of vessels is an easy operation, and should be used chiefly as a preliminary to partial thyroidectomy in severe cases. The superior thyroid pedicle on one or both sides should alone be tied, as access to the inferior thyroid artery is difficult and not much less severe than partial thyroidectomy. Moreover, the inferior thyroid veins are not tied at the same time, and it is quite probable that occlusion of veins is an important factor in the success of the ligature operation. Partial thyroidectomy, usually of one lobe, is undoubtedly the most efficient measure, and should be the operation of choice. It probably acts in two ways: first, by the removal of diseased tissue it diminishes the dose of toxic secretion being absorbed, and so produces an immediate improvement; second, the incision of and relief of tension in the gland directly affects the disease process itself, and so produces a more lasting effect.

As to results, it may be said that all patients who survive the operation show some improvement; that in really early cases, where the symptoms have not fully developed and the diagnosis is made chiefly on the ocular and thyroid physical signs, the improvement in almost all cases is complete and permanent; that in moderate and severe cases the results are more capricious, but that in at least 50 per cent the results are extremely satisfactory, though complete restoration to the normal is not infrequently prevented by the persistence of an isolated symptom such as exophthalmos. The most striking results are seen in the severest cases. Such patients may be restored from a state of bed-ridden invalidism to active life, though they usually retain some fixed residual symptoms. Of the moderate and severe cases, a considerable number—perhaps as many as 25 per cent—develop, after a period of excellent health of six months to two years, a recurrence of thyroid swelling and a return of symptoms. Such relapses usually yield readily to a further partial thyroidectomy.

With regard to the selection of cases for operative treatment, but few definite rules can be laid down. It is not possible to recognize cases clinically which are especially likely to give satisfactory results. There can be little doubt that the earlier the case the more likely is a single operation to be curative. The chief object of selection must be to avoid cases in which the operation is likely to be particularly dangerous. No case should be operated on during an acute exacerbation; vomiting, diarrhœa, and fever of any considerable height, should be absolute contra-indications for the time. The patient's mental state is most important; if she is anxious to get well, and looks forward to the operation without fear, she is much less likely to suffer severely during it and afterwards than if she is much agitated by the thought of it and the preparations for it. It is highly desirable to keep the patient in bed for a week or two before the operation.

Graves' disease usually attacks a previously healthy thyroid, but sometimes it occurs in a gland already containing colloid tumours. Such cases do not sensibly differ as to course and prognosis from the ordinary type, and must be carefully distinguished from those of colloid goitre with mere hyperthyroidism.

6. **Thyroid Grafting.**—This procedure has not fulfilled the hopes of its originators. It may be considered in cases of cretinism, myxœdema, or cachexia strumipriva in which there is some obstacle to securing regular administration of thyroid extract, or there is exceptional difficulty in giving a satisfactory dose without producing toxic symptoms. Grafts are usually implanted in one of three situations, the subperitoneal tissue, the cancellous medulla of a long bone, or the spleen. In the last-named the results are said to be most satisfactory, but the operation is not without danger. Subperitoneal grafting has the advantage of simplicity, and is not very much less satisfactory than the other

methods. None but perfectly normal thyroid tissue should be used ; two or three masses of about a cubic centimetre each may be implanted. The effect generally is rather that of a large dose of thyroid gradually absorbed, than of the establishment of a permanent source of normal secretion.

GENERAL FEATURES OF THYROID OPERATIONS.

No detailed description of operations will be attempted here, but it is desirable to indicate in broad outline the principles which must be followed in such procedures.

Anæsthesia.—Ether given by the open method, and following an injection of scopolamine, morphine, and atropine, is undoubtedly the most generally applicable of all anæsthetics for thyroid cases. Anæsthesia should be induced while the patient is in bed.

Local anæsthesia, especially if preceded by the injection of scopolamine and morphine, is very often useful and satisfactory. It is particularly applicable to cases of very well-defined encapsuled tumours which can be enucleated, especially cysts. It cannot be so thoroughly relied on for hemithyroidectomy, especially if the goitre is large. For operations in Graves' disease it is on the whole decidedly less valuable than ether.

Incisions.—The incision of choice in all ordinary cases should be the transverse collar-cut of Kocher following exactly the natural flexures of the skin. The only disadvantage of this incision is the imperfect access it gives to the upper pole of the lateral lobe. If the ends of the incision be much upturned to overcome this defect, the visibility of the scar is greatly increased, and the advantage of the method is lost. Where freedom of access is of great importance, as in dealing with exophthalmic goitre or malignant disease, cosmetic considerations must be disregarded. In Graves' disease, an incision along the whole length of the lobe to be removed, and about the anterior border of the sternomastoid, is very satisfactory. In malignant disease, a long transverse incision is often desirable, extending even to the anterior edge of the trapezius on the side of the disease. The sternomastoid is divided near the sternum, and the glands of the posterior triangle removed with the affected thyroid lobe. A similar though shorter incision, with or without division of the sternomastoid, is very useful for the removal of intrathoracic goitres.

Drainage.—Drainage by a tube for twenty-four hours should almost always be practised. Its sole purpose is to prevent the wound becoming distended with blood-clot, a complication which prolongs the discomfort of convalescence, and may delay healing. If continued for more than twenty-four hours, a mucoid discharge of thyroid juice is apt to persist for several days and cause some risk of infection. Even the large cavity left by the removal of an intrathoracic goitre should not be drained for more than twenty-four hours. Doubtless it usually fills up with blood, but primary union is the rule.

The Operation of Enucleation and its Modifications—With the recognition that most localized thyroid swellings are not true adenomata, the practice of formal enucleation has somewhat declined. It is most satisfactory for the removal of cysts. The gland is exposed and incised until the wall of the cyst is met with, and then the latter is enucleated. If the cyst is large there can be no objection to puncturing it, as that renders removal quite easy through a comparatively small incision. Almost always there is rather obstinate bleeding from the cavity left in the thyroid ; in stopping this, the nearness of the recurrent nerve to the postero-interior aspect of the gland should be remembered.

In most cases it will be found convenient to combine partial enucleation with resection or excision of the part of the gland to which the tumour is most adherent. There can be no advantage in persisting in carrying out a formal enucleation in the face of serious adhesion and hæmorrhage, when a partial excision is so much easier.

Hemithyroidectomy.—This is the operation of choice for extensive colloid disease, for exophthalmic goitre, and for malignant disease. Except in the case of the last-named, it is generally best to leave a small part of the postero-internal border of the lobe to guarantee the safety of the recurrent nerve. In colloid disease this is not desirable if there is a process of the gland extending inwards between the trachea and œsophagus.

After the infrahyoid muscles have been split longitudinally, the superior thyroid pedicle is defined, divided, and ligatured. The lobe can usually be dislocated into the wound, and the subsequent dissection made easier. It is then best to deal with the inferior thyroid pedicle, cutting through the gland substance rather than dividing the

vessels outside the capsule. The gland is always firmly fixed by dense fibrous tissue passing between its inner surface at the junction of lobe and isthmus to the side of the cricoid. In cutting through this ligament, the risk of injuring the trachea must be remembered.

In dealing with exophthalmic goitre, every effort should be made to prevent the operation being either long or bloody. Two precautions are necessary for this—a free incision to give complete exposure of the lobe, and the definition and securing of all vessels before they are divided. An attempt to do the operation through a restricted incision, and by methods which would be perfectly adequate in dealing with a colloid goitre, can only lead to unnecessary or even uncontrollable hæmorrhage, and, at the least, undue delay.

Operations for Intrathoracic Goitre.—It is desirable to lay stress on the fact that, formidable as they appear, cases of intrathoracic goitre are almost always operable. No patient suffering from this very distressing condition should be left without an attempt being made at relief. The operation, it is true, demands some special knowledge and a certain amount of fortitude from the surgeon, but when successful its results are brilliantly satisfactory. A large horizontal incision should be made, and it is often well to divide the sternomastoid. If the intrathoracic mass is attached to one of the lateral lobes, this latter should be freed from its pedicles and the isthmus, and can be used to make traction on the intrathoracic mass. The tumour is rarely adherent within the chest, and can as a rule be readily separated by the finger, so that serious bleeding is quite unusual. When the tumour is firmly adherent within the chest, it is sometimes recommended that it should be enucleated from within its capsule by the use of a large scoop. This method should be avoided, if possible, as it may render prolonged drainage necessary. In a difficult case, after division of the sternomastoid it is possible to insert the whole hand, with the exception of the thumb, through the upper thoracic opening. In this way even a firmly adherent goitre can be detached from its thoracic attachments.

After-treatment.—After the operation, the patient should be propped up in the sitting position, with her head slightly bent to allow the wound surfaces to fall together. In all ordinary cases convalescence is rapid after the first forty-eight hours. The tube should be removed on the first day, the stitches on the seventh or eighth, and the patient allowed to get up about the tenth. In cases of Graves' disease there is always a considerable exacerbation of the symptoms immediately after the operation. Restlessness, fever, palpitation, hurried respiration, and profuse secretion of pharyngeal and bronchial mucus, are the chief symptoms. If they have not become severe by the end of the first twenty-four hours the outlook is good, and they usually subside during the next day or two. Morphia should be given at the first onset of serious restlessness, and combined with atropine if there is much mucous secretion. Every effort should be made to reassure the patient and to prevent her giving way to alarm, which always aggravates symptoms. The temperature is always raised for the first few days, and may remain between 100° and 101° for as long as ten days. Such fever need give rise to no anxiety as to the asepsis of the wound.

Post-operative Tetany.—It has been pointed out that total thyroidectomy is very rarely a justifiable operation; if that conclusion is accepted, tetany will rarely be met with in thyroid surgery. It is, however, a fact of experience that this complication sometimes occurs after hemithyroidectomy. In such cases the distribution of the parathyroids is doubtless abnormal, and removal of those of one side has sufficed to produce a parathyroid insufficiency. This complication can usually be controlled by the administration of calcium lactate in full doses. The drug should not be given continuously for more than a few days at a time, and the need for it seems gradually to subside, presumably through compensatory hypertrophy of the remaining parathyroids.

Wilfred Trotter.

GONORRHŒA.—The efficient treatment of gonorrhœa is quite as important as that of syphilis; and, as in the latter disease the principal object of treatment is to modify the intensity of the syphilitic virus as early as possible, and thus prevent the appearance of tertiary lesions, so in gonorrhœa our aim should be to minimize its ill-effects, and to prevent the supervention of complications. Gonorrhœa is an infective disease due to a specific micro-organism, the gonococcus, which is capable of rapid extension and

proliferation, and which, unless dealt with at the earliest possible opportunity, will ultimately involve the whole of the urethral mucous membrane. Not only does it affect the urethra locally, but ultimately it may give rise to a general blood infection, which is the cause of many of the later phenomena of the disease. The majority of the serious complications of this disease do not present themselves until the prostatic portion of the urethra is involved; consequently the primary aim of treatment is to prevent the gonococcus from reaching that part of the urethral mucous membrane.

The one agent which is destructive to the gonococcus is nitrate of silver, but even in weak solutions this sets up such an irritation of the urethral mucous membrane as to preclude its use. However, of late years various modifications of nitrate of silver have been devised which, whilst destructive to the gonococcus, are only slightly irritating to the urethral mucous membrane, and are capable of penetrating into its deeper layers. Amongst these may be mentioned protargol, nargol, argyrol, argentamin, albargin, ichthargan, and argonin, of which the first two have yielded the best results in the experience of the writer. Solutions of these substances of 1 to 2 per cent strength are applied to the urethral mucous membrane by injections introduced by means of a urethral syringe in the following manner : The patient should first empty his bladder, and should introduce the nozzle of the urethral syringe into the meatus, and inject a sufficient quantity of the solution to distend the urethra gently (about 2 to 3 drachms). The syringe is then withdrawn, and the solution retained in the urethra for a gradually increasing period of time, starting at two minutes, but ultimately extending to twenty minutes, in proportion to the severity of the case and the tolerance of the individual ; the injections should be used three or four times daily. The injections may at first cause some increase in the amount of the discharge and of the ardor urinæ, but they will shortly modify the purulency of the discharge, and will be productive of little if any pain. In exceptionally acute cases, owing to the extreme tumefaction of the mucous membrane and to the intense pain, it may be necessary to postpone the use of injections for a few days.

If encountered sufficiently early, the abortive treatment may be applied : A solution of eucaine and adrenalin is injected into the anterior urethra, and the urethroscopic tube is introduced as far as the bulb. All discharge and moisture having been absorbed by pledgets of cotton-wool fixed on a holder, the whole of the anterior urethra is thoroughly swabbed out with a solution of protargol, 5 to 10 per cent, and subsequently mild antiseptic irrigations are employed for a few days.

Acute gonorrhœa may also be treated by Bier's method of passive venous congestion : a glass cylinder, fitted at the open end with a rubber diaphragm, adapts itself accurately to the root of the penis, and a vacuum in the cylinder is created by means of a small pump.

Acute gonorrhœa has recently been treated by the application of heat, for the reason that the gonococcus is said to be destroyed by exposure to a temperature of 104° F. One method of applying the heat is by means of a double catheter, the inner compartment of which is connected with an irrigator by means of a rubber tube, whilst an outer provides an outlet for the injected water. The instrument is introduced into the bladder, and water is conveyed to it from the irrigator, first at a temperature of 114°, and subsequently increased to 125° ; the treatment is continued for thirty minutes. The heat may also be applied by means of gum-elastic or metal bougies heated by an electric resistance coil enclosed within them, and the temperature is regulated by means of a thermometer ; the temperature may be raised to 150°, maintained for fifteen minutes, and the process may be repeated two or three times a week. In eleven acute cases the gonococci disappeared on the fifth day.

Formerly, the treatment of the early stage of gonorrhœa was simply a palliative one, by means of alkalis and sedatives, and consequently the gonococcus was given a free scope, and was rather encouraged to make its way to the posterior urethra ; but now that the pathology of the disease is better understood, the treatment is commenced at the earliest possible opportunity, with the view of repelling and exterminating the invading germ. During the decline of the disease, the injections of the nitrate of silver compounds should be continued until on careful microscopical examination no gonococci can be discovered in the discharge. Then recourse may be had to astringent injections such as a solution of the sulphate, permanganate, sulphocarbolate, or chloride of zinc, or of sulphocyanide of mercury 1–5000, and this treatment should be continued for a week after the

final disappearance of the discharge. In obstinate cases an injection of the four sulphates may be tried, e.g. :—

℞	Zinci Sulphatis Aluminis Sulphatis Ferri Sulphatis		Cupri Sulphatis Aquam Destillatam	āā gr. x ad ℥viij

To be diluted with two parts of water, and the strength gradually increased.

Or,

℞	Zinci Sulphocarbolatis Hydrargyri Perchloridi Acidi Carbolici	℥ss gr. ss gr. x	Glycerini Aquam	℥ss ad ℥viij

As a substitute for injections, treatment by irrigation of the urethra with weak solution of permanganate of potash or ichthyol solution has been recommended, and as a modification of this, Janet's treatment must be mentioned. It consists in the introduction, under pressure, of antiseptic or astringent solutions through the urethra into the bladder, without the assistance of a catheter. In Janet's original method permanganate of potash solutions were employed, but all the modifications of nitrate of silver already alluded to may be utilized, as also solutions of mercury perchloride, bismuth subnitrate, sodium salicylate, or hydrogen peroxide. As a preliminary to the irrigation treatment, it is recommended that a dose of atropine should be administered by means of a suppository containing gr. $\frac{1}{30}$ to $\frac{1}{20}$, the object being to put the affected organs at rest by preventing the automatic and reflex muscular actions of the sexual organs, which are under the control of the hypogastric plexus.

At the commencement of the attack, a brisk purgative should be administered, and subsequently a saline aperient may be taken every other morning. As aids to the local treatment, the so-called balsamic remedies, copaiba, cubebs, sandalwood oil, thyresol or methyl ether of sandalwood, or gonosan, should be given, preferably in the form of capsules, but should not be persevered with if they give rise to any disturbance of the digestive functions, or if they set up a dermatitis. A light diet is an essential factor in the treatment, and abstinence from all alcoholic drink, from highly seasoned dishes, shell-fish, asparagus, and coffee should be enjoined ; at the same time any sexual excitement must be absolutely prohibited, and any violent exercise, especially riding, should be forbidden. Large quantities of bland, demulcent fluid, such as barley-water, will, by diluting the urine, considerably lessen the pain experienced on micturition. Diuretics and vesical disinfectants such as hexamine, piperazin, and helmitol are also valuable adjuncts to treatment of the disease in all its stages.

Considerable advances have of late been made in the treatment of gonorrhœa in all its stages by the introduction of colloidal preparations made in the Crookes laboratories, and also by detoxicated gonococcal vaccines made by 'Genatosan Ltd.'. Amongst the colloidal preparations which have met with the greatest success are 'pallamine' (colloidal palladium) and 'trimine' (a form of colloidal manganese, with iron and zinc in addition). In gonorrhœa pallamine will be found to be most serviceable in the acute stages of the disease, and before the infection has reached the posterior urethra. My custom is to commence treatment with an intramuscular injection into the buttock of pallamine 0·5 c.c., and on the following day give an injection of 1 c.c. of the detoxicated vaccine at a dosage of 1000 millions of dissolved gonococci per c.c. ; by means of this detoxication, doses of vaccine of one hundred times the strength of those formerly injected can be introduced without the supervention of any toxic symptoms. Doses of pallamine and vaccine are administered on alternate days for ten days or a fortnight ; the effect on the discharge shows itself very early in the course of treatment, and the early and painful symptom of acute ardor urinæ is promptly ameliorated. If the discharge does not yield to this treatment, intramuscular injections of trimine may be administered on alternate days, with a mixed detoxicated vaccine made up with the gonococcus mixed with secondary organisms—pneumococcus, staphylococcus, and diphtheroids. This treatment is of course ancillary to the local measures previously indicated.

A certain proportion of cases will yield to treatment carried out on the above lines, but not infrequently the discharge persists in spite of all efforts to check its progress, and the condition of chronic gonorrhœa, or gleet, ensues. Here the discharge may proceed

from the anterior part of the urethra, and is then caused by involvement of some of the urethral follicles, by stricture of the urethra, or by granular patches or papillomata of the urethral mucous membrane. If the cause is situated anteriorly to the compressor urethræ muscle, it can be discovered by urethroscopic examination, and usually requires treatment applied locally down the urethroscopic tube; thus any granular patches and papillomata, or the orifices of any of the urethral lacunæ which might be affected, may be touched with a solution of nitrate of silver (5 to 20 gr. to 1 oz. water), and if any constriction of the urethra or any peri-urethral thickening is present, it should be treated by the passage of bougies in increasing sizes up to 25 or 28 F. If the gonococcus has reached the prostatic urethra, a region inaccessible to the ordinary injection, it is advisable to apply a few drops of the nitrate of silver solutions by means of a Guyon's syringe.

COMPLICATIONS.

The complications of gonorrhœa are manifold, and often of vital importance, but the majority of them do not occur until the prostatic portion of the urethra has been infected.

Gonorrhœa of the Anterior Urethra.—This may be complicated by: Acute lymphangitis, folliculitis, peri-urethral abscess, inflammation and suppuration of Cowper's glands, and chordee.

Lymphangitis.—In acute gonorrhœa the lymphatics of the penis and the inguinal glands may be the seat of inflammatory changes, causing phimosis, a cord-like enlargement of the dorsal lymphatics of the penis, and swelling and tenderness of the inguinal glands. This condition seldom proceeds as far as suppuration, and usually yields to treatment by rest, purgatives, and hot fomentations.

Gonorrhœal Folliculitis.—In this condition the glands of Littré in the floor of the urethra are invaded by the gonococcus and form small hard nodules easily displayed by urethroscopic examination, and palpable to the touch on the under surface of the corpus spongiosum. They may be treated by the passage of a large metal instrument on which they can be massaged or may be opened by means of a sharp wire passed down the urethroscope.

Peri-urethral Abscess may occur in connection with the urethral follicles, and is met with at any portion of the urethra from the meatus to the bulb; the pus may make its way into the urethra, or towards the skin, and its escape externally is preferable to its bursting into the urethra, since in the latter case recurrence is frequent; these abscesses should be opened by skin incision directly fluctuation can be detected.

Abscess of Cowper's Glands will form a perineal swelling which will also require to be opened and drained.

Chordee.—The pain of chordee may be relieved by the application of cold, or simply by the act of micturition, and the tendency to erection may be treated by opium and belladonna suppositories, or by a mixture of bromide of sodium and extractum salicis nigri liquidum.

Gonorrhœa of the Posterior Urethra.—The following complications may be met with: Acute and chronic prostatitis and prostatic abscess, epididymitis and orchitis, seminal vesiculitis, and cystitis, possibly extending up the ureter and giving rise to pyelitis.

Acute Prostatitis.—The pain may be relieved by suppositories of opium and belladonna, by immersing the patient in a hot hip-bath, by leeches to the perineum, and, if an abscess has formed, it may be opened by a perineal incision.

Chronic Prostatitis is a common cause of chronic urethral discharge, and is a condition requiring prolonged treatment; from its chronicity and its tendency to recurrence it is accompanied by considerable depression, both mental and bodily, and is a fruitful cause of sexual hypochondriasis. The treatment consists of instillations into the affected portion of the urethra of a few drops of the nitrate of silver solutions in the strength of 5 gr., 10 gr., or 20 gr. to 1 oz.; suppositories of opium, belladonna, and ichthyol, cold hip-baths, cold rectal and perineal douches, careful regulation of the bowels, restricted diet, and the avoidance of violent exercise and sexual excitement. In obstinate cases massage of the prostate gland per rectum, followed by instillations of a solution of nitrate of silver, is often attended by beneficial results.

Epididymitis is one of the most frequent complications of gonorrhœa, and at the same time one of the greatest gravity, since it is liable to cause sterility by obliterating

the tube of the epididymis and so causing azoospermia. The essential point in the treatment is to suspend the testicles, and at the same time to apply heat and pressure. This is best effected by a 'Jullien's' suspensory bandage, the bag of which is large and made of thick waterproof tissue ; this is evenly padded with cotton-wool and applied to the scrotum, and exerts pressure on the testicles when the lateral tapes are adjusted ; it is retained in position by abdominal and perineal straps. The effect of this is to give almost instantaneous relief from the severe pain which is inseparable from this condition, and also to promote the absorption of the inflammatory effusion. At the same time, the prostatic urethra should be treated by small instillations of nitrate of silver solutions, with the view of preventing the spread of the disease to the other testicle. As adjuncts to the local treatment, rest, light diet, and aperients may be prescribed.

Seminal Vesiculitis, if acute, should be treated by rest, cold or hot rectal irrigations, leeches to the perineum, and opium and belladonna suppositories ; if an abscess forms in the vesicles, a perineal incision should be made, and the abscess approached and evacuated by dissection between the bladder and rectum. If chronic, the distended vesicles should be emptied of their contents by massage with the forefinger through the rectum ; this should be carried out once or twice weekly, together with instillations of nitrate of silver solutions. Catheterization of the common ejaculatory ducts has been carried out by means of the passage of a large urethroscopic tube, through which a fine catheter has been introduced into the orifices of the ducts ; the object of the treatment is not to irrigate the seminal vesicles, but to break down an obstruction to the escape of the secretion therefrom, and to relieve the condition of vesicular retention. Vesiculectomy has also been practised, the vesicles being removed by perineal, ischiorectal, or inguinal incision.

Cystitis is another complication frequently met with in posterior gonorrhœa, but it is usually limited to the region of the neck of the bladder, and is chronic in degree. In this condition rest is necessary, the diet should be light, and large quantities of barley-water should be administered ; to counteract the vesical spasm and consequent frequency of micturition, opium and belladonna suppositories should be introduced, and the patient should be placed in a hot hip-bath. A very valuable remedy in cystitis is helmitol or anhydromethylene citrate of hexamethylenetetramine ; this, in consequence of the ample liberation of formaldehyde, acts as a powerful disinfectant upon the urine, and also imparts to it an acid reaction ; it should be given in doses of 10 to 15 gr., three or four times a day, administered with large quantities of water or soda-water. Gentle irrigation of the bladder with warm solutions of boracic acid, salicylate of soda, or nitrate of silver and its modifications, is indicated in the subacute and chronic forms of cystitis.

Gonorrhœal Rheumatism is another grave complication of a posterior gonorrhœa, and is caused by a generalized infection of the blood by means of the gonorrhœal toxin ; it may affect the joints or peri-articular structures, the sheaths of tendons, fasciæ, and bursæ. Treatment should be directed firstly towards the urethral affection, and instillations of nitrate of silver solutions may be made into the prostatic or any other portion of the urethra affected. Intramuscular injections of soluble mercurial salts are of the greatest value in this condition, and succinimide of mercury in doses of $\frac{1}{3}$ gr., introduced twice or three times a week, has been attended with remarkable success. Another preparation which is strongly advocated in cases of gonorrhœal arthritis is intramine (diorthoamino-thiobenzine) ; this is introduced intramuscularly in doses of 1·5 c.c., followed by the same dose on the third day, and by 2·5 c.c. a week later. The joints or other structures involved in the process may first be treated with cold applications by means of an ice-bag, spirit lotion, or Leiter's tubes, and must be kept at complete rest ; later, counter-irritants may be prescribed, such as iodine liniment, blistering, and the actual cautery ; pressure by means of Scott's dressing and strapping, or by elastic bandages, may relieve this condition, and also the hot-air bath and massage may be employed. In acute cases leeches may be applied, also Bier's passive congestion method, cataphoresis, and hot-air baths. If the affected joint is greatly distended, it may be necessary to relieve it by aspiration and by the injection of tincture of iodine or some weak astringent lotion. Internally, large doses of alkalis may be administered, or the salicylates of soda and quinine, iodides, salol, or acetylsalicylic acid.

One condition which appears to predispose to these joint complications in gonorrhœa

is seminal vesiculitis, and if this condition is discovered to be present by rectal examination, it should be treated on the lines already indicated.

Gonorrhœal Ophthalmia is caused by inoculation of the conjunctiva with gonorrhœal pus, and may be met with in adults and in newly-born children infected with pus from the maternal vagina ; its progress is characterized by its rapidity and destructiveness ; the condition is thus one calling for prompt and energetic measures. Locally, solutions of nitrate of silver 5 gr. to the ounce, of collosol argentum 1–2000 as an eye lotion, of protargol, or of argyrol, should be applied daily to the whole conjunctival surface by means of a camel's-hair brush, and the superfluous lotion should be washed from the eye with warm water or weak boracic lotion. Any accumulation of discharge must be prevented by the frequent application of astringent and antiseptic lotions such as boric acid, alum, perchloride of mercury, or sulphate of zinc. Cold-water compresses will considerably relieve the pain, as also will the application of one or two leeches above the outer angle of the orbit. The greatest care must be taken to avoid inoculation of the sound eye, and this is best effected by securing a watch-glass over it with strips of strapping. The treatment internally should consist of a brisk purgative at the commencement, and later of tonics, anodynes, and even stimulants in cases where much bodily and mental depression is present. In ophthalmia neonatorum, local treatment with weaker nitrate of silver solutions and antiseptics is indicated, and its success and the recovery of the patient will depend mainly on the skill and assiduity with which the prescribed treatment is carried out by the nurse.

Gonorrhœal Iritis is an occasional complication of gonorrhœal rheumatism, and is characterized by its subsequent tendency to recurrence. Locally, atropine and cocaine lotion should be applied three or four times a day, and mercurial ointment with iodine and belladonna may be rubbed into the temporal region ; internally, salicylate of soda, iodide of sodium or ammonium, acetylsalicylic acid, or quinine will be productive of benefit.

In rare instances gonorrhœa is complicated by peritonitis, pericarditis, endocarditis, and spinal meningitis, the treatment of which should be carried out on general surgical and medical principles.

GONORRHŒA IN THE FEMALE.

In the female, gonorrhœa may primarily affect either the vagina, the vulva, or the urethra, whence it may spread to adjacent organs of importance.

Vaginal Gonorrhœa in the acute stage should be treated by vaginal douches of hot water if the patient can submit to them, and on the subsidence of the acute symptoms a vaginal speculum may be passed, and the vaginal mucous membrane may be thoroughly swabbed out with a strong solution of nitrate of silver, 10 gr. to the ounce, or with a 5 per cent solution of protargol or nargol, and after this a glycerin tampon be introduced. The more chronic forms of vaginal discharge may be treated by astringent injections given three or four times daily ; the solutions usually employed are sulphate of zinc, sulphocarbolate of zinc, permanganate of zinc, chloride of zinc, and alum. Douching with a solution of Milton has been attended with considerable success ; this preparation is a strongly hypertonic saline solution containing free hypochlorous acid in unusually high proportions ; it is used in the strength of half an ounce to the pint ; it is non-toxic, and is a rapid solvent of pus and mucus. After the use of the douche, one of Pond's medicated tampons may be inserted into the vagina, and allowed to dissolve.

Gonorrhœal Vulvitis may be treated by hot-water applications at first, and subsequently by painting over the inflamed surface with a strong solution of nitrate of silver, 20 gr. to the ounce, after which the parts should be dressed with pledgets of lint soaked in lead and opium lotion.

Gonorrhœal Urethritis should first be treated by alkalis and hyoscyamus taken internally, and also large quantities of barley-water ; if there be much pain and difficulty in micturition, immersion in a hot hip-bath, and the introduction of a few drops of cocaine solution into the urethra, will afford relief. On the subsidence of the acute stage, the balsamic remedies above mentioned may be prescribed internally, and the urethra may be painted over with a solution of nitrate of silver, 2 gr. to the ounce, or instillations of a solution of protargol, 5 to 10 per cent, may be injected into the urethra.

Abscess of Bartholin's Glands is a frequent complication of gonorrhœa in women, and should be treated by early incision and plugging the cavity with antiseptic gauze; if the abscess recurs, the whole of the gland should be dissected out.

Gonorrhœal Warts or vegetations may be met with in both sexes, but attain far greater magnitude in women than in men. As their progress appears to be encouraged by moisture, the principal indication for treatment is to keep the region dry by applying a dusting powder of starch, oxide of zinc, or savin powder. The more exuberant form of warts will require severer methods, such as the application of caustics, e.g., carbolic acid or acid nitrate of mercury, or removal with the knife or the thermo-cautery.

From the vagina the disease may extend up the cervix uteri to the body of the uterus, thence along the Fallopian tubes to the ovaries, and possibly to the peritoneal cavity; but the treatment of these conditions belongs rather to gynæcology than to genito-urinary surgery. (*See also* ELECTROTHERAPEUTICS.) *J. Ernest Lane.*

GOUT.—No routine treatment can be adopted which is suitable to all cases of gout. The nutritional condition of the patient, his habits, surroundings, and mode of life, constitute factors that necessarily modify the treatment of individual cases; and with gout, as with so many other diseases, it will be found that each case requires separate study and frequently special treatment. Quite apart from the treatment of an attack, which is a comparatively simple and easy matter, must be considered the condition or conditions which led up to it. The gouty individual is one whose general metabolism is unstable, and this instability may be present in one or more of the great physiological systems—digestive, nervous, circulatory, etc. Which of these is primarily and mainly at fault should always be a question for patient investigation, and one must then endeavour to improve the metabolism of that system by suitable medicinal, dietetic, and hygienic measures.

The treatment of gout should aim at treating the following manifestations: (1) *The gouty paroxysm* in acute cases, and the relief of the pain as speedily as possible; (2) *The subacute or chronic condition*, and the prevention of recurrence; and (3) *The affected joints*, with the object of removing the uratic deposits and of preventing permanent deformity.

1. **Acute Gout.** *The Treatment of the Gouty Paroxysm.*—The limb should be placed in the horizontal position, or slightly elevated above the level of the body, and a cradle should be arranged to remove the weight of the bedclothes off the affected part. To alleviate the severe pain in the joint, warm packs should be arranged round it, consisting of cotton-wool saturated with a soothing lotion, and then lightly covered with oiled silk. I have found the following lotion most useful in relieving the local pain:—

℞	Sodii Carbonatis	℥ij	Tincturæ Opii	℥iss
	Linimenti Belladonnæ	℥ij	Aquæ	q.s. ad ℥viij

A small portion of the lotion should be mixed with an equal quantity of hot water, and then poured on cotton-wool previously arranged round the joint. The pack should be changed every two hours. In connection with the acute paroxysm no attempt at local depletion—such as the application of leeches to the inflamed joint, blistering, or incisions—should on any account be made, owing to the great liability of thereby extending the inflammatory condition, and so producing subsequent ankylosis or deformity.

For the internal treatment, colchicum is one of the most valuable drugs we possess. It should be used especially for acute gout, and for subacute attacks supervening on chronic gout. If employed continuously, tolerance may be acquired, and then the drug ceases to act. At the commencement, a large dose, 30 to 40 min., of colchicum wine should be given, followed by a mixture containing in each dose 15 to 20 min. of the wine, with from 40 to 60 gr. of citrate of potassium, which should be administered three times a day. The citrate of potassium is given for its combined properties of acting as a diuretic and of diminishing the acidity of the urine, and may, if desired, be used as an effervescing mixture, 30 gr. of potassium bicarbonate to 20 gr. of citric acid. Colchicum reduces the gouty inflammation, relieves pain, and shortens the attack. It should only be taken under medical advice, and never in such doses as to produce extreme depression; after the inflammation of an acute attack has subsided, the colchicum should be gradually diminished until it is discontinued.

A very useful method of administering colchicum is in the form of its active principle, colchicine, which may be given in doses of $\frac{1}{80}$ to $\frac{1}{50}$ gr., three or four times a day immediately after food. Only a few patients will tolerate the larger doses, the contra-indications being the production of diarrhœa and intestinal griping. The following constitutes a very useful pill :—

℞ Colchicinæ	gr. $\frac{1}{60}$	Extracti Hyoscyami	gr. $\frac{1}{2}$
Sacchari Lactis	gr. $\frac{1}{2}$	Extracti Gentianæ	gr. j
Extracti Nucis Vomicæ	gr. $\frac{1}{4}$		

Three or four grains of blue pill should be given the first night of an acute attack, followed by a dose of Epsom salts in the morning. Mercury should be given only in sufficient doses to produce its cholagogue effect, as, owing to the possibly defective action of the kidneys, the mercury absorbed into the general system may be eliminated with difficulty. In the employment of purgatives for gouty patients, the great object is not to produce powerful purgation, but to relieve portal congestion and intestinal catarrh. A pill containing either euonymin 2 gr. or podophyllin $\frac{1}{4}$ gr., combined with extract of hyoscyamus 1 gr. and compound extract of colocynth $1\frac{1}{2}$ gr., will, in many cases, be found very useful.

If the pain of an acute attack of gout is so severe as to prevent sleep, barbitone or methylsulphonal may be given, or a full dose of extract of hyoscyamus with blue pill at night will, in some cases, act as a very useful anodyne. The administration of opium or morphine should, if possible, be avoided, owing to the risk of its deficient elimination, and also on account of its diminishing the amount of urine, and its tendency to derange digestion and check hepatic metabolism.

2. **Subacute and Chronic Gout.** *Means of checking the Excessive Formation of the Toxic Agents of Gout.*—These consist in careful attention to diet and regimen, the promotion of the metabolism of the liver, and the relief of congestion of the portal system, which can be effected by keeping the bowels open at least once a day. In addition to colchicum in small doses, guaiacum may usefully be administered, as an alterative which stimulates the metabolism of the liver and also affords relief to the portal system. From 5 to 10 gr. of guaiacum resin should be given in cachets two or three times a day, according to the effect on the bowels, since guaiacum sometimes acts as a laxative. The powdered guaiacum resin given in cachets is far preferable to the tincture of guaiacum in a mixture, as in the latter form a nauseous medicine is produced, and the precipitated resin may cling obstinately to the tongue and fauces. In cases of chronic gout the colchicum may very conveniently be administered in the form of the colchicine pill, three times a day. Colchicine, however, should not be given in marked interstitial nephritis, as in such cases a fatal result has been known to follow its administration in medicinal doses. Should constipation occur, a sulphur-and-guaiacum tablet, or compound liquorice powder, may be administered at night. An occasional dose of the blue pill and euonymin, followed by a purge of Epsom salts, will be found useful. If the patient is suffering from atony and debility of the stomach, nux vomica or strychnine may be given with potassium citrate. Iron preparations are not as a rule well tolerated by the gouty ; but if anæmia is present, the citrate of iron and ammonium, or the carbonate of iron, will be the best to administer.

Means of promoting the Elimination of the Toxic Agents of Gout.—This may be effected by medicinal treatment, and by diet and regimen. Citrate or bicarbonate of potassium should be employed as a diuretic which increases the volume of the urine while it diminishes its acidity. The use of the potassium salt may with advantage be pushed until moderate alkalinity of the urine is produced ; by such means the quadri-urates are rendered more soluble and stable than they are in acid urine, and the tendency to the deposition of uric acid or sodium biurate in the kidney tissues is removed. Free diuresis should also be encouraged by the drinking of sufficient quantities of water. A gouty patient should avoid the excessive use of common salt at table, owing to its power in diminishing the solubility of sodium biurate, and thereby hastening the precipitation of that body.

The use of Alkalis and the Salts of Alkalis.—Of the potassium salts the citrate and the bicarbonate are the two most commonly employed. I am fully assured as to the

beneficial effects of employing a potassium salt in conjunction with colchicum in the treatment of acute and subacute gout, and in my experience the citrate is the most useful. If given in sufficiently large doses it tends, by its conversion into the carbonate within the kidneys, to diminish the acidity of the urine (which is generally high in connection with the gouty paroxysm), while at the same time it increases the solvent power of the urine for the uric acid salts, and so assists their elimination. In cases of sluggish action of the liver, of gastro-intestinal catarrh and torpor, of gouty dyspepsia, and of other forms of irregular gout where there are no appreciable uratic deposits in the joints, mineral waters containing sodium salts are undoubtedly beneficial, owing to the action of those salts as hepatic and gastro-intestinal stimulants.

The lithium salts, in my opinion, are not so useful as the potassium and sodium salts. The chief objection to their use is their greater toxicity and depressing action on the heart as compared with the potassium salts. They consequently have to be given in such small doses that I am doubtful whether they possess any remedial effect. On the other hand, I constantly meet with patients suffering from cardiac depression as the result of the excessive and continued consumption of lithia tablets, which are so persistently, speciously, and wrongly vaunted as curative of gout.

In gouty conditions associated with disturbance of the functions of the liver, the most important consideration is the restoration of that organ to its normal activity, and here the alkaline sodium salts are especially useful. There is no better treatment at the outset than a dose of blue pill or calomel at night, followed by Epsom or Carlsbad salts in the morning. Subsequently, a pill containing a small dose of blue pill or calomel combined with euonymin and colocynth will be found most useful. In such cases a mixture which I have found most beneficial in stimulating the liver, and also the gastro-intestinal tract, is one containing sodium bicarbonate, gentian, and nux vomica, taken a quarter of an hour before meals.

Atophan is a drug which is decidedly useful in some cases of subacute and chronic gout. It should be given in doses of 15 gr. four times a day, and preferably administered in cachet form.

Further Treatment of Chronic Gout.—The enlargement and tenderness of the gouty joints is due to two causes—the deposition of sodium biurate in the cartilages and fibrous structures, and a chronic inflammatory thickening of the fibrous tissues. For the reduction of this last-mentioned thickening, as well as for painful gout of the sole of the foot, and for gouty neuralgic affections, iodide of potassium given internally is a useful remedy. This drug should not, however, be regarded as a solvent of gouty deposits, and it is contra-indicated if advanced kidney disease exists. It should be given in doses of 5 to 10 gr. three times a day, and may usefully be combined with from 5 to 10 min. of weak tincture of iodine.

3. The Local Treatment of Gouty Joints.—If there is much persistent swelling, the limb should be elevated as much as possible, and a light flannel bandage applied to the joint. If the œdema continues, the hot douche, followed by sponging with a cold strong solution of common salt, will be found serviceable. The application of the so-called solvents of uric acid externally is useless, as they are not solvents of sodium biurate. Careful massage and gentle exercise of the stiffened joints should be employed, but only when convalescence is fairly established. The Scotch douche is very useful when the conditions are chronic. A good-sized stream is thrown with considerable force upon the affected joint, employing first cold water for half a minute, and then hot; the latter should be as hot as the patient can bear, and should be continued for one minute. This process is repeated for fifteen or twenty minutes. The repeated alternations of temperature produce a stimulating effect upon the circulation about the joint, and so increase tissue change and favour absorption. Massage of the joint should be resorted to immediately after the douching, as the tissues are then in a relaxed condition.

In many cases of chronic articular gout, the salt pack is efficacious. It consists of flannel soaked in a warm saturated solution of common salt, which is wrapped round the part, covered with oiled silk and a bandage, and kept on all night. It should be repeated nightly as necessary. For the stiffness and thickening of joints, careful rubbing with iodide of potassium and soap liniment may also be employed. The thermal baths of Bath, Buxton, Harrogate, Strathpeffer, Llandrindod Wells, Aix-les-Bains, and other spas,

and mud baths, are useful in the treatment of these cases. Treatment by baths should, however, be avoided by patients suffering from acute gout, by very old people, and by those suffering from any serious cardiac affection.

Massage, Electricity, and Baths.—A sedentary life and deficient exercise conduce to gout, owing to a lowering of general metabolism, to depressed vigour of blood-circulation, and to impairment of movement in the lymph-channels. Since the lymph-circulation is mainly carried on by muscular movements and respiration, the beneficial influence of massage and muscular movements on many gouty subjects becomes readily intelligible. Massage should never be resorted to in cases of acute gout, as it not only aggravates the disease at that stage, but also causes severe pain ; it should be reserved for the more chronic cases. Massage produces an increase in the amount of blood and lymph passing through the tissues concerned, at the time and afterwards. This improves the nutrition of the affected tissues, promotes absorption of deposits, and restores physiological activity. In subacute or chronic cases, where the joints remain swollen and œdematous and are the seat of considerable deposits, much benefit is frequently derived from massage and galvanism. Each of the affected joints should be massaged for a few minutes, and then galvanism (5 to 10 milliampères) applied for a few minutes with the negative pole over the affected region, to be again followed by massage. Under this combined treatment the œdema and deposits frequently disappear rapidly. Probably the beneficial effects are due mainly to the increased circulation of blood and lymph induced, and the consequent absorption that takes place. I have also found, in many cases, that a decidedly beneficial influence on gouty joints is produced by electric-light baths, followed by electrical treatment in the form of cataphoresis to the affected joints.

Electric-light and superheated-air baths increase the oxidative processes within the body, as is shown by the increased elimination of carbon dioxide from the lungs, and also by the increased metabolism of the body in general. They also stimulate the circulation of the blood and lymph in the affected joints, and so lead to improved nutrition. This curative action undoubtedly continues after the treatment has been discontinued. Such treatment, therefore, is better given intermittently, say six baths on alternate days ; then intermit for two or three weeks, and so on. These baths improve the atrophic condition of the muscles. They cause a temporary elevation of the body temperature, marked reddening of the skin of the part treated, profuse local or even general perspiration, quickened pulse, lowered arterial tension, and generally considerable amelioration of the pain, and in some cases complete disappearance of it for a time. Radiant heat has a greater penetrative effect than other forms of heat, and in my opinion the effect is more stimulant. In cases of acute or subacute gout, the pain, as a rule, recurs at varying intervals after a bath, but usually with diminished severity ; and frequently a progressive reduction of the pain occurs after the use of subsequent baths. Undoubtedly many cases of chronic gout do not show much improvement after the use of electric-light or superheated-air baths, and I have frequently experienced great difficulty in selecting the patients most likely to be benefited by them. In my experience, chronic gout of long standing, with considerable deposits in the joints, is not much benefited by these baths ; for such cases undoubtedly more good can be done by the employment of vapour baths, followed by massage of the affected joints, a method which is frequently most useful in producing softening and absorption of the deposits. Electric-light baths, however, seem to set up improved circulatory and trophic changes in the joints, which are maintained long after the baths have been discontinued. If only one limb is attacked, the question arises as to whether that limb should be locally treated by being placed in a small specially-constructed bath, or whether the ' entire body ' bath should be used. In my experience, the latter is always the more useful, with, in the case of the electric-light bath, an extra localization of the heat and light rays on the affected part. That means that the more extensive the surface to which the heat and light rays are applied, the better is the result. When these baths are not obtainable, very good results may be obtained by the use of an ordinary blanket-tent with a small opening at the top to let out the hot air saturated with moisture. The hot air is supplied by a ring Bunsen gas-burner, or by a large spirit-lamp with a flue passing through an opening in the blanket at the foot of the tent.

Cataphoresis is useful in many cases of chronic gout with considerable deposits in

the joints. By cataphoresis is meant electric osmosis, or the transfer through porous partitions from anode to cathode. The joint may be treated either by immersion in a local bath of the fluid which is to be introduced, the positive electrode being placed in the bath and the negative on the back, or the positive electrode may be kept thoroughly wet by frequent applications of the fluid. The negative electrode should be a large one, about 8 inches by 5 inches, made of zinc, and protected by a flannel cover. It is well moistened with warm water and applied to the lumbar or dorsal region. At the positive pole either potassium bicarbonate or lithium iodide may be introduced into the affected joint. In the former instance the positive electrode is kept thoroughly wet with a saturated solution of potassium bicarbonate ; in the latter, the joint is painted over with iodine liniment, and a pad of lint soaked in a saturated solution of lithium carbonate is laid over the iodine surface ; on the lint the positive electrode, which should be a large flat one, is placed, and closely applied to it. Care must be taken to have everything *in situ* before turning on the current, so as to avoid any shock, and to give an easy, steady flow of current. Currents of from 10 to 30 milliamèpres may be employed. For the treatment of gouty neuritis, constant-current baths are usually most beneficial ; electric-light or superheated-air baths, followed by the use of the constant current, generally do an equal amount of good.

In the acute or subacute stage of gout, or when a slight attack has just started, the Turkish bath is most undesirable. I have known of its employment in such cases being followed by an exacerbation of the attack, and extension to joints not at the time affected. This is a point which should be borne in mind by medical men, as many patients on the first appearance of an attack are apt to have immediate recourse to the Turkish bath, and it is well that they should be warned of the danger they thereby incur.

Treatment of Irregular Forms of Gout.—*Gouty Eczema.*—In this condition, special attention should be given to two details : (1) See that the bowels are freely opened, which at the outset may be secured by the administration of blue pill or calomel, followed by a saline ; (2) Entire abstention from alcohol is most desirable, at all events during the persistence of the eczema. It is best that any form of alcohol should be abstained from, but more especially, in my experience, the red wines. I have met with cases occurring among gouty individuals past middle age in whom two or three glasses of claret or port or burgundy will, in the course of a few hours, cause the development of an eczema. During the irritative stage of dry gouty eczema I have found the application of a lotion consisting of liquor plumbi subacetatis 1 drachm, liquor carbonis detergens 1 drachm, aqua sambuci ad 1 pint, most soothing, especially if followed by the use of a simple dusting-powder, such as cimolite powder. For the acute moist type of eczema a similar lotion, but with a preparation of opium replacing the tar solution, is advisable. In cases of gouty pruritus, or, as it is sometimes termed, latent gouty eczema, the severe itching is frequently relieved by the use of carbolic acid lotion. When the eczema is in a chronic condition, much benefit is usually experienced from immersion in sulphur baths, such as those of Harrogate, Strathpeffer, Aix-les-Bains, etc. After the bath the skin should be carefully dried, and a dusting powder, such as cimolite powder, freely applied. In cases of gouty eczema and gouty pruritus, a careful dietary must be enforced, care being taken to forbid all articles which the experience of the patient has shown to produce dyspepsia. Such persons should avoid acid fruits, as strawberries, gooseberries, apples, and pineapples ; rhubarb also should be excluded from the dietary. As regards the medicinal treatment, my experience is that it is not necessary to give the ordinary anti-gout remedies, such as colchicum, etc. It is much more important to treat the dyspepsia and the catarrhal condition of the gastro-intestinal tract which are generally present as associated or causative conditions, by the administration of subcarbonate of bismuth with the bicarbonate of sodium or the bicarbonate of potassium.

Hyperchlorhydria.—The treatment of this condition consists in a proper regulation of the diet, by cutting off any excess of the protein articles of diet and by neutralizing the superfluous acid by the administration of some alkali. A drug that I have found most useful in the treatment of this hyperchlorhydria is hopogan (magnesium peroxide). It not only gives immediate relief to the pain and discomfort by its neutralizing effect on the excess of acid, but it also parts with one half of its oxygen and acts as an internal antiseptic. It is a most valuable drug in many abnormal gastric and intestinal fermenta-

tions. It is a white tasteless powder, and is best given in a little milk, in doses of 20 to 30 gr. three or four times a day, taken one hour after meals. If it exerts too great a purgative effect the dose should be diminished. It is also very useful in allaying the irritation in many cases of gouty pruritus, which is probably due to absorption of a toxin or toxins from the intestinal tract.

Hepatic Torpor.—A very common form of irregular gout is due to defective metabolism of the liver, and is known as hepatic torpor, or hepatic inadequacy. In this form, the fæces are pale, generally very offensive, and, as a rule, constipation occurs. Slight jaundice is usually present, as evidenced by a yellowish conjunctiva and muddy complexion, and the urine is highly coloured, of high specific gravity, and very acid. In the treatment of this form of irregular gout the most important consideration is the restoration of the liver to its normal state of activity, and here the alkaline sodium salts are especially useful. There is no better treatment at the outset than a dose of blue pill or calomel at night, followed by a dose of Epsom salts or Carlsbad salts in the morning. Subsequently, a pill containing a small dose of blue pill or calomel, combined with euonymin and colocynth, will be found most useful. In such cases of gouty hepatic inadequacy, a mixture which I have found most beneficial as regards its stimulating effect on the metabolism of the liver, and also of the gastro-intestinal tract, is the following, which should be taken a quarter of an hour before meals :—

℞				
	Sodii Bicarbonatis	gr. xij	Spiritus Chloroformi	℥xij
	Tincturæ Nucis Vomicæ	℥v	Aquam Menthæ Piperitæ	ad ℥j
	Tincturæ Gentianæ Co.	℥ss		

Gouty Phlebitis.—For the treatment of this fairly common form of irregular gout the patient should be kept in the recumbent position, and any sudden movement of the affected limb must be prevented on account of the danger of detaching a portion of thrombus and the occurrence of consequent embolism of the pulmonary artery. Equal parts of glycerin and extract of belladonna should be smeared over the affected part, and a linseed poultice, with some of the glycerin and extract of belladonna spread on the surface, should be applied and renewed every six hours. In addition to this, the ordinary treatment of the gouty state must be resorted to.

Gouty Dyspepsia.—In addition to the usual remedies, such as bismuth subcarbonate, sodium bicarbonate, bitters, etc., taka-diastase is a most useful drug in this affection. It is made up in the form of tablets containing 2½ gr., and one of these should be taken immediately before each meal. The taka-diastase encourages the digestion of the carbohydrates, and so prevents the development of fatty acids, which, by their irritating effects, are so common a factor in the development of gouty dyspepsia.

Insomnia.—This is a fairly common symptom in gouty patients. Usually it is not complete, but confined to restlessness, interspersed with intervals of light or broken slumber. In such cases attention should be paid to the patient's pulse, and to the possible existence of albumin in the urine. If, as is frequently the case, the pulse is found to be of high tension, the administration of blue pill or calomel, followed by a saline purge, will probably prove most beneficial.

With regard to the use of tobacco, the majority of gouty patients may be permitted a moderate indulgence in smoking, but it should be avoided entirely by those who suffer from paroxysmal attacks of the gouty heart.

Preventive Treatment.—I have now had a considerable experience of the prophylactic effects of guaiacum resin, and I know of no drug which is more useful in the preventive treatment of gout. Its action is probably due to its stimulating effect on hepatic metabolism, thereby increasing, as it undoubtedly does, the elimination of uric acid. I prefer to give it, as explained above, in the form of the powdered resin in cachets, commencing with doses of 5 gr. three times a day after meals, and gradually increasing the dose to one of 10 to 12 gr.

Mineral Waters.—The value of a given mineral water in the treatment of gout depends greatly on the object with which it is taken. For instance, it may be given to remove gouty deposits, to stimulate the action of a sluggish liver and to relieve portal congestion, for the treatment of gouty dyspepsia, to relieve the bowels in cases of torpor and gastro-intestinal catarrh, to act on the kidneys, or to relieve gouty affections of the skin. It is

manifest that any one mineral water is not likely to produce all these effects, and it is also conceivable that a water which might effect one of these purposes might prove injurious if employed to fulfil another. No doubt considerable error has arisen from indiscriminately sending gouty patients to a particular spa, without duly considering whether the water of that spa is suited to the specific gouty disorder from which the patient is suffering.

There is a tendency with some medical men to consider that the efficacy of a natural mineral water is due solely to its watery constituent; in other words, that its one therapeutic use is that of a flushing agent. On the other hand, an exaggerated importance is not infrequently attached to the particular salts contained in a mineral water as ascertained by chemical analysis. The fact is, that in judging of natural mineral waters we have been too much under the domination of analytical chemistry, and our deductions from these results have been consequently biased and cramped. The more I consider their therapeutic effects, the more convinced I am that chemical analysis, although it can inform us what their mineral constituents are, is yet unable to determine exactly the state of the salts dissolved in them. The 'ionic or electrical dissociation theory', and the existence of the mineral constituents of natural waters as 'ions', are leading our thoughts to a new and, I believe, more correct appreciation of the therapeutic values of these waters. In intimate relation with this aspect of the matter is the question of radio-activity as possessed by these waters. Most, if not all, which have been subjected to examination, have been found to be distinctly radio-active, and the lower the mineralization of the water, the more intense is its radio-activity. In this, I think, lies the explanation of the fact that an artificially prepared mineral water, although identical in chemical composition with the natural one, does not possess the same therapeutic effects, since it is lacking in the property of radio-activity. A natural water at the moment of its discharge from the earth is radio-active, whereas an ordinary drinking water does not possess this property to any appreciable extent. Hence also the desirability of drinking the water at its source, since by bottling and keeping a natural water the radio-activity is to a great extent lost.

Useful as may be the drinking of the water at a spa, yet equally or even more so is the encouragement of the functions of the skin by balneological methods for therapeutic purposes. The skin is the largest organ of the body, and it possesses various and complex functions. Amongst these are: (1) The excretion of toxic bodies, the retention of which prove harmful, and ultimately fatal, to the organism; (2) The power it possesses through its nerve-endings of stimulating distant organs and tissues; and (3) Its heat-regulating power. The success of balneology, whether in the treatment of chronic joint conditions, of affections of the fibrous tissues, of certain heart and kidney affections, or of certain skin diseases, depends upon the recognition of the powerful aid which can be given by the skin in restoring the normal balance.

If the view as to the intestinal origin of the toxæmia present in gout is correct, the value of mineral waters, both as curative and preventive agents, becomes at once intelligible, from the marked influence they have on the metabolism of the intestinal tract, and their power of removing by the bowels the antecedents of the toxin causing gout.

It is especially in cases of chronic gout, of gastro-intestinal catarrh and torpor, of gouty dyspepsia, sluggish action of the liver, gouty eczema, gouty glycosuria, and of other forms of irregular gout, that mineral waters prove so valuable; whilst the various baths, combined with massage, are so useful in producing softening and absorption of the deposits in the joints and other tissues. Patients actually suffering from acute or subacute articular gout, or who are apparently on the verge of such an attack, are better without sulphur waters, as in such cases the waters tend to accentuate or precipitate an attack in the joints.

Choice of a Spa.—In the selection of a spa, so many factors have to be considered that it is impossible, in a work of this nature, to deal fully with the subject. I wish, however, to state clearly that the high state of efficiency to which our home spas have been raised, render it no longer essential to banish our patients to foreign health resorts, and that, unless a complete change of environment is desired by our patients or is essential to their recovery, treatment can, in the great majority of cases, be carried out as effectually in our own country.

The following table may be of some value, as being an attempt to classify the therapeutic indications of mineral waters in the treatment of gouty conditions.

CLASSIFICATION OF THE VARIOUS MINERAL WATERS ACCORDING TO THEIR THERAPEUTIC VALUE IN THE TREATMENT OF THE VARIOUS FORMS OF GOUT.

OBJECT OF TAKING THE WATER.	THE WATERS BEST SUITED TO THE PURPOSE.
Absorption of gouty deposits from the joints and tissues.	Bath, Buxton, Contrexéville, Gastein, Harrogate, Pfaefers, Strathpeffer, Teplitz, Vittel, Wildbad, Aix-les-Bains (for baths).
Treatment of gouty dyspepsia.	Brides-les-Bains, Carlsbad, Ems, Harrogate, Homburg, Kissingen, Neuenahr, Royat, Vals, Vichy, Wiesbaden.
Treatment of gouty congestion and torpor of the liver, and of gastro-intestinal catarrh and torpor.	Baden-Baden, Bourbonne, Carlsbad, Cheltenham, Contrexéville, Harrogate, Homburg, Kissingen, Leamington, Llandrindod, Marienbad, Neuenahr, Tarasp-Schuls, Vals, Vichy, Vittel, Wiesbaden.
Treatment of gouty affections of the respiratory organs.	Ems, Royat.
Treatment of gouty glycosuria and diabetes.	Carlsbad, Contrexéville, Harrogate, Kissingen, Leamington, Llandrindod, Marienbad, Neuenahr, Strathpeffer, Vals, Vichy, Vittel.
Treatment of gouty skin affections.	Aix-les-Bains, Baden, Bagnères-de-Luchon, Harrogate, Llandrindod, Schinznach, Strathpeffer.

DIET IN GOUT.

No hard-and-fast lines as to dietary can be laid down. Each individual must be carefully considered as regards his habit of body, his capacity for the digestion of different articles of food, the amount of exercise he is able to take, and the nature of his work. Derangements of the gastro-intestinal tract constitute a most important factor in the development of acute, chronic, and irregular gout. It is of the utmost importance to secure and maintain a healthy condition of the gastro-intestinal mucous membrane and a normal daily evacuation, in order to guard against auto-intoxication, which is undoubtedly an early factor in the development of the gouty condition. The patient can certainly diminish the number and severity of the attacks, and in many cases prevent their recurrence, by careful attention to diet, to the quality and the quantity of fluid taken, to exercise, and to a sufficient daily action of the bowels. In advising as to diet, the personal factor is a most important one, and it is wise to gain some knowledge as to the likes and dislikes of the patient with regard to food. In this connection it is well to remember the saying of Sydenham, that " more importance is to be attached to the desires and feelings of the patient, provided they are not excessive, than to doubtful and fallacious rules of medical art ".

It should be well borne in mind that great changes in diet should not be made too abruptly. The researches of Pawlow show that a habit of digesting easily any particular kind of food is acquired by the stomach, which secretes a gastric juice appropriate to it, so that if the food is suddenly changed, time is required for the digestive organs to accommodate themselves to the altered conditions. If the change is too sweeping and too abrupt, the patient will probably suffer. It is well known that the excessive consumption of rich nitrogenous food, combined with excesses in wine and malt liquors, both induce and excite gout. The comparative immunity of females and young people is mainly explained by the absence of such determining causes, combined with (in the case

of young people) the absence of predisposing cause, and also the fact that the secreting functions are in full activity. The subjects of gout are generally persons who live well and consume a large amount of animal food.

Gouty people may, for dietetic purposes, be roughly grouped into three classes: (1) Those who suffer from more or less frequent attacks of acute gout; (2) Those who have never suffered from an acute attack, but who are constantly subject to some chronic form of regular or irregular gout, especially after slight indiscretions in diet; (3) Those who are only affected with gouty symptoms (generally of the irregular kind) when they eat or drink certain articles, and therefore have to be specially watchful over their diet.

Animal Food.—It must be remembered, on the one hand, that animal foods constitute to the majority of people the most attractive and appetizing forms of diet, and are therefore likely to be taken in excess; hence the necessity for limiting the amount to be taken. On the other hand, it is most desirable to increase the combustion and the oxidative powers within the tissues. In my opinion, it is absolutely erroneous to exclude from the dietary of the gouty such articles as meat, fish, and tea because they are assumed to contain uric acid. No class of foodstuff gives so great an amount of energy and produces so much heat as animal food, and no class is more easily digested by the majority of gouty people. On the whole it may be stated that animal food such as fish, chicken, game, and meat, is best suited to the majority of cases, whilst foods of the farinaceous class are most likely to disagree. White meats, such as chicken and fish, are more digestible than red meats. The quantity of meat, and especially of red meat, must be restricted in those cases in which the kidneys are imperfectly performing their eliminatory functions, as evidenced by a pale urine, of low specific gravity, deficient in urea and purin bases.

Vegetable Food.—A fair proportion should be taken with two meals each day. The choice of vegetables will depend upon the digestive capacity of the patient, but, excepting the potato, as a rule those that grow above ground are preferable to root vegetables. At the same time it must be borne in mind that with certain patients some of these vegetables may produce some form of dyspepsia, and I cannot too strongly urge that in the dieting of the gouty no hard-and-fast rules can be laid down, but the idiosyncrasy of each patient to various articles of food must be made the subject of careful observation and study. Due consideration should also be given to the patient's experience of what articles of diet disagree and agree with him.

Simplicity of Meals.—The diet should be simple; that is, the meals should not be made up of too many articles. Simplicity of food means facility of digestion. Moderation in both eating and drinking is perhaps one of the most essential points to insist on. Certainly meat, even red meat, should not be excluded. Those articles of diet that are known in the individual to favour intestinal fermentation and putrefaction should certainly be avoided, and, speaking generally, a sense of discomfort after a meal indicates that some food has been taken which is not beneficial to the individual in his present condition. If the gouty symptoms are due to over-production of toxic material from faulty intestinal and hepatic metabolism, and if, at the same time, the kidneys are sound, then a diet which mainly consists of animal food is indicated; and in extreme cases of this class, even the so-called 'Salisbury diet' may be useful. If, on the other hand, the symptoms are due to defective elimination on account of diseased kidneys, then a more vegetarian diet will be best. The value of the so-called 'Salisbury diet' consists in the small amount of energy necessary for the digestion of so simple a diet, and in the fact that it contains little which can set up intestinal fermentation or putrefaction. On the other hand, a strictly vegetarian diet requires more digestive energy than a purely animal one, and a much larger quantity of vegetable food must be taken to produce an equal nutritive effect. If, during the treatment of gout, an attack of gouty dyspepsia should intervene, a milk diet should be employed until the dyspeptic symptoms have abated.

Starchy and Saccharine Foods.—Starchy foods should be especially limited in amount in those individuals who are subject to gastric hyperacidity (hyperchlorhydria). When intestinal fermentation and putrefaction occur, as evidenced by a sense of discomfort after a meal, I attach great importance to the reduction of the starchy articles of food, but not to the total exclusion of—what I believe to be comparatively harmless—the potato. Undoubtedly, amongst patients who suffer from an inability to digest starchy articles of diet—in other words, from amylaceous dyspepsia—a reduction for the time in the amount

of starchy foods taken, including potatoes, is desirable; but the recognition of the existence of amylaceous dyspepsia is a fairly easy matter, and, when present, it can be suitably treated. Certainly those who are gouty and fat should be very sparing in the use of potatoes, as of other carbohydrates. I wish, however, to protest against the too general exclusion of so common and useful an article of diet as the potato.

Potatoes can best be taken by the gouty in the crisp form which requires thorough mastication and insalivation. Boiled new potatoes should be absolutely interdicted.

Equally wrong, in my opinion, is the total exclusion of sugar from the dietary of all gouty individuals. Undoubtedly in certain cases sugar may do harm, as in persons who are fat, who suffer from glycosuria, or who are prone to attacks of eczema—in such it should be cut off; but that is no reason for the exclusion of it from the dietary of all, and especially those who are, at the same time, gouty and thin; such subjects may also take in moderation marmalade and wholesome jams. I know of many gouty individuals who take sugar with absolute impunity. Some subjects undoubtedly digest all starchy articles of diet very badly, and, in such, fats may well take the place of starches. Fat bacon, properly cooked, is generally well digested. Bread may advantageously be given as crisp toast, in the form of rusks, or in the 'zweiback' or twice-baked form, as in these conditions it requires thorough mastication and insalivation.

Fruits.—Any fruit, which from experience is known to agree with the patient, may be taken. Apples and oranges generally do best. Uncooked fruit should never be taken at a meat meal, and is best consumed fasting, fairly early in the day, as between breakfast and lunch. It should always be thoroughly masticated. Strawberries are frequently avoided owing to their producing in some subjects a certain amount of temporary irritation of the skin, but this generally passes off in a short time. In a few subjects, strawberries produce eczema or some other rash; but such cases merely represent idiosyncrasy to the special fruit, and necessarily such individuals, whether gouty or not, should not eat strawberries. I am, however, strongly of opinion that the indiscriminate banishment of strawberries from the dietary is unnecessary. Except in these cases of idiosyncrasy they constitute a good article of diet for the gouty, on account of their delicious flavour, their antiscorbutic properties, and their richness in potassium salts. It is very necessary that they should be ripe and fresh. They quickly decompose, and in such a state aid in the development of those intestinal fermentations which are so inimical to the gouty.

Alcoholic Drinks.—Stated as a general principle, a person who is subject to gout is better without alcohol in any form. There are, however, some who require a little alcohol, either to aid digestion or to enable them to get through their work. If alcohol is necessary or desirable, the form in which it is to be taken is frequently a matter which the patient can decide better than the medical man; but I would insist upon the importance of definitely limiting the amount to be taken, and of restricting its consumption absolutely to meals. Some patients find a little whisky or brandy suits them best, others prefer a light, still, white wine, while a very few find that a light claret agrees best with them. Champagne is seldom suited to the gouty, especially if taken daily. In elderly or feeble people, a moderate amount of pure whisky undoubtedly does good, but the indiscriminate ordering of whisky is, I am sure, wrong. Port is especially unsuited to the majority of gouty subjects, its gout-producing properties, I believe, being mainly dependent upon the ethereal compounds which give the aroma or bouquet to the wine. If this view is correct, it would explain the well-known fact that old and matured ports are much more provocative of gout than comparatively new ports taken direct from the wood. The development of the ethereal compounds in the wine extends over many years, and especially progresses after the wine is laid by in bottles. In a few cases of asthenic gout, especially in old people, a moderate amount of comparatively new port, taken direct from the wood, undoubtedly does good.

In my opinion the wines which are least injurious as a rule to gouty subjects to whom it is found necessary to order a small amount of wine, are the light, still, white wines, such as certain French and Austrian wines, and a few of the lighter Australian and Californian wines. The latter, owing to their greater alcoholic strength, should be taken diluted with water or some mineral water.

Patients suffering from glycosuria or diabetes should entirely abstain from alcoholic drinks, unless marked debility and loss of appetite necessitate the restricted administration

of them. Those subject to attacks of eczema are also much better without alcohol in any form.

'Rough cider', that is, the completely fermented apple juice, taken in moderation, agrees well with most gouty subjects. It contains but a small percentage of alcohol, is free from sugar, and its acidity is chiefly due to malic acid, which passes into the circulation in the form of alkaline malates, which in their turn are converted in the kidneys into alkaline carbonates and excreted as such, thereby increasing the elimination of urates. The bottled or 'champagne' cider, which is imperfectly fermented, should never be used, owing to its undoubted liability to set up gastro-intestinal fermentations. Dry or 'rough' cider, mixed with an equal quantity of an aerated water, is an excellent beverage. Dry perry is also a suitable drink for the subjects of gout.

Diet in Acute Gout.—During the attack a diet must be given which shall tend to check the abnormal metabolism of the gastro-intestinal tract and of the liver, which shall be non-irritating to the kidneys, and which diminishes the production of the purin bodies. For the first day or two the patient should be restricted to a milk diet, which may consist of milk, bread-and-milk, and tea made with boiling milk instead of with water. Weak tea, with cold toast thinly buttered, may also be taken. The free drinking of hot or cold water, Salutaris water, or of some mineral water free from sodium salts, should be encouraged. The milk diet should be continued until the acute inflammation is subsiding, which stage is indicated by the lessening of the pain, and by the pitting, on pressure of the affected parts. No alcohol in any form should be given during this stage, unless there are strong reasons for its administration, such as a weak action of the heart and a feeble, irregular pulse, when a little well-matured whisky or brandy, diluted with Salutaris water, will prove the best form of alcohol. Beef-tea and any of the meat extracts or essences should be avoided at all times by gouty patients, owing to their tendency to irritate the kidneys, and to introduce into the circulation waste nitrogenous bodies. With the subsidence of the acute attack the patient may return to a more liberal diet, care being taken to avoid anything indigestible.

Articles of Diet that should be Avoided by the Gouty.

Rich meat soups: ox-tail, turtle, mock turtle, kidney, mulligatawny, hare, giblet.

Salmon, mackerel, eels, lobster, crab, mussel, salted fish, smoked fish, preserved fish, tinned fish.

Duck, goose, pigeon, high game.

Meats cooked a second time, hare, venison, pork, lean ham, sweetbread, liver, kidney, salted, corned, or cured meats, pickled meats, preserved and potted meats, sausages; all articles of food pickled in vinegar; all highly seasoned dishes and rich sauces.

Tomatoes, beetroot, cucumber, rhubarb, mushrooms, truffles.

Rich pastry, rich sweets, new bread, cakes, nuts, dried fruits, ices, ice cream.

Diet Suitable in Chronic Gout and for Gouty Subjects.

Morning.—Half a pint to a pint of hot water, flavoured with a slice of lemon-peel should be slowly sipped immediately on rising.

Breakfast.—A selection may be made from the following articles of diet, according to the taste of the patient: Porridge and milk, whiting, sole, or plaice, fat bacon, eggs cooked in various ways, dry toast or 'zweiback bread' thinly buttered, and tea infused for three minutes and then strained from the leaves. Fat bacon is digestible when grilled but less so when boiled. Eggs should not be taken hard-boiled.

Lunch and Dinner.—Soups suitable for the gouty are vegetable purées, and soups made by boiling beef bones or mutton bones with vegetables, and subsequently removing the fat, which separates on cooling. These soups should not be thickened with farinaceous substances.

The varieties of fish most suitable to the gouty are whiting, sole, turbot, plaice, smelt, flounder, grey mullet, and fresh haddock.

The birds that are admissible as articles of diet are chicken, pheasant, turkey, and game (not high).

Butcher's meat—mutton, lamb, and beef—should be taken at only one meal in the

day, and then in moderate quantity. Two vegetables may be taken at both lunch and dinner. Any of the ordinary vegetables may be taken, except those previously mentioned as best avoided; but those that are most likely to prove beneficial to gouty subjects are spinach, Brussels sprouts, French beans, winter cabbage, Savoy cabbage, turnip-tops, turnips, and celery. Potatoes may also be taken in moderate quantities. Stewed fruits, or baked apples or pears, may be taken every day at one meal.

Green vegetables as salads may be taken, provided bottled oily dressings are avoided. A simple savoury may, if desired, be taken at the end of dinner, or a small quantity of cheese, if well masticated, and if free from the fungus or mould.

Night.—Half a pint to a pint of hot water, flavoured with a slice of lemon-peel, should be slowly sipped before retiring to bed.

* * * * * *

With regard to persons who are disposed to gout, but are not actually suffering from it, the usual mixed diet may be taken, but they should limit the starchy articles of food, and should avoid all rich sweets, rice, tapioca, and sago. Thin and ill-nourished subjects require modifications in their diet as compared with those who are stout; while those who take plenty of exercise may be allowed food forbidden to the indolent. Individuals who especially benefit by a reduction of diet, both as regards quantity and quality, are those overfed people who are past middle life. *Arthur P. Luff.*

GRANULAR KIDNEY.—(*See* Nephritis, Chronic.)

GRAVEL.—(*See* Oxaluria; Phosphaturia; Uric Acid Gravel.)

GRAVES' DISEASE.—(*See* Goitre, Exophthalmic.)

GUMBOIL.—(*See* Teeth, Caries of.)

GUMS, TUMOURS OF.—(*See* Jaws, Tumours of.)

GUNSHOT WOUNDS.—This article deals with the treatment of gunshot wounds in civil practice. The type of gunshot wound likely to be met with in this country was previously limited to those inflicted by pellets from shot-guns, revolver bullets, and occasional accidental wounds from small-bore rifles. In previous editions of this book these types of wounds were alone considered. Bombing attacks from the air and the possibility of long-range bombardment have greatly extended the class of wound which the civil practitioner may be called upon to treat, and this article has therefore been largely re-written as a result of wider experience in the recent war. The chief difference between civil and military practice lies in the fact that, in the former, treatment without delay in properly equipped hospitals, with no lengthy transport, is under ordinary circumstances available.

The missiles which cause gunshot wounds may be small lead pellets from shot-guns, small-bore rifle bullets, larger bullets from revolvers, spherical leaden bullets from shrapnel shells, fragments of shell or bomb cases of all shapes and sizes.

First Aid.—Generally speaking, the wound should be interfered with as little as possible. The clothing should be cut away to expose the wound, which, without attempts at washing or cleansing, should be covered with sterile gauze and wool kept in position by bandage or strapping. Firm pressure will in most cases arrest hæmorrhage. If, however, this be profuse and not readily so controlled, the temporary application of a tourniquet is permissible, provided always that proper and efficient treatment is shortly available. It is in large lacerated wounds that hæmorrhage is most difficult to control, and, in this case, any accessible spurting vessel should be seized with pressure-forceps, which may be left in position, or the vessel may be tied. Where the bleeding point is not accessible under the circumstances in which first aid is being rendered, the wound may be firmly packed with dry gauze. The skin opening must be enlarged for this purpose. It is of no use trying to control bleeding by pushing gauze into a large ragged cavity through a narrow skin wound. Sensation is so deadened that the necessary slitting of the skin may be done without anæsthesia. It should be realized, however, that where proper surgical treatment can shortly be obtained there is not the same objection to the use of

a tourniquet as exists in military practice, where many hours of delay and transport lie before the patient. It is most important that plugging of the apertures of wounds caused by small missiles should be avoided. Infection is thereby almost certain to be spread to the depths of the wound—often previously sterile. Shock is best treated and prevented by warmth. The patient is well covered by blankets, both above and below him, during his removal to hospital. Hot-water bottles can generally be improvised. Broken bones should be kept at rest as efficiently as possible by splints. In no case is this more important than in fractures of the femur. It is hoped that Thomas's splints may be more generally used as first-aid appliances. Instruction in their use should form part of all ambulance classes.

General Treatment of Wounds.—On arrival at hospital, treatment should be undertaken at once. In the case of small punctured wounds caused by bullets or small shell fragments, the apertures of entrance and exit, should such exist, are covered with a piece of sterile gauze while the surrounding skin is shaved, carefully cleansed with ether or spirit, and painted with tincture of iodine. The gauze is then removed from the wounds, which are treated thoroughly in a similar manner. No attempt is made to interfere by probing, syringing, or otherwise with the depths of the wound. A sterile dressing is then applied and the part kept at rest. In most cases the wound runs an aseptic course, a scab forming at either end of the bullet track. When this separates, a small dimpled cicatrix remains. If the missile is retained, it may be removed if easily accessible. Otherwise it should be left. If it gives trouble later, it may be removed by the most accessible route after accurate localization.

In the case of small leaden pellets, similar treatment is necessary. They penetrate only for a short distance, but are difficult to find. An attempt to remove them frequently fails, always leads to a tedious operation in which much damage may be inflicted, and is unnecessary. If any individual pellet causes trouble later, its removal should not be undertaken without the aid of a fluorescent screen during the operation. When a wound from a shot-gun is inflicted at a short distance, the whole charge of shot, with perhaps wads in addition, may enter the body together and cause a severe lacerated wound. This is treated on the same general lines as a lacerated wound from a shell fragment.

In dealing with lacerated wounds from shell fragments, the whole future progress of the case depends upon the performance of a careful and complete cleansing operation. A general anæsthetic is given. The wound being protected by gauze, the surrounding skin is prepared as for an ordinary aseptic operation—indeed the strictest asepsis is needed in every step of the operation. The wound is enlarged, if necessary, and all its recesses are thoroughly and completely exposed. All metallic fragments, shreds of clothing, dirt, and débris are removed. Lacerated fragments of muscle are excised, and blood-clot is cleared away. When this has been done, primary suture of the wound should be performed. It is essential for success that all dead spaces should be obliterated. Sutures must therefore be passed deeply, and at times buried sutures of catgut must be employed. The skin edges are carefully trimmed, as little skin as possible being sacrificed. The necessary measures to ensure complete rest of the part are adopted. Primary union may be anticipated in a majority of cases. If, owing to the extent of the wound or gross soiling, the surgeon is not satisfied with the completeness of his cleansing operation, the wound may be packed with sterile gauze, soaked in liquid paraffin to facilitate removal, or Carrel-Dakin treatment may be instituted. If the wound remains clean, suture may be performed in a day or two—the term 'delayed primary suture' being given to this proceeding. If infection takes place, Carrel-Dakin treatment is continued, careful watch is kept for spread of suppurative processes or pocketing of pus, and, when the wound has again become healthy and granulating, secondary suture is carried out. The fitness of the wound for suture may be checked by bacteriological examination.

Small lacerated gutter wounds should be excised *en bloc*, the incisions passing through healthy tissue, and then sutured completely.

In all cases of lacerated gunshot wounds it is wise to administer antitetanic serum as a prophylactic measure.

Gas Gangrene.—Where there has been extensive laceration of muscle and soiling of the wound, gas gangrene may develop. It is unlikely, however, that gas gangrene will be more than a rarity in wounds met with in civil practice. A careful cleansing

operation, and the removal of muscle the vitality of which is lost, is the best means of prevention. Should gas gangrene occur, the wound should be thoroughly opened and all muscle cut away until a healthy bleeding and contracting area of muscular tissue is reached. Should this fail, or should the gangrene be so extensive as to render this impracticable, amputation should be performed. The face of the stump is carefully examined to ascertain that the muscles are healthy. Any individual muscles which show signs of infection must be freely excised: this may involve their complete removal up to the point of origin. The amputation flaps should be left open and suture performed later.

Wounds of Blood-vessels.—Wounds of vessels of any magnitude will generally need to be treated by ligature, vessels partially divided being severed completely and the two ends tied. Rarely it may be possible to suture a rent in a vessel wall. In the case of division of a main arterial trunk without injury to the vein, there is evidence to show that deliberate division and ligature of the latter lessens the likelihood of gangrene. Secondary hæmorrhage is treated by immediate ligature of the bleeding point. *No temporizing must be countenanced.* If the bleeding point be inaccessible, ligature of the main trunk proximally may, on rare occasions only, be permissible. Such a measure frequently fails altogether, and often results in gangrene. It is, however, certainly justified in hæmorrhage deep in the buttock, when the internal iliac artery should be tied transperitoneally. Exsanguination of the patient should be treated by blood transfusion.

Wounds of Nerves.—These should be treated on the lines laid down in the article on NERVES, PERIPHERAL (q.v.).

Wounds of Bones.—The surgeon must decide at once whether the damage to the limb is such as to make its recovery unlikely or to make it functionally useless after recovery. The danger to the patient's life entailed in the effort to save the limb, and the amount of damage to joints, vessels, and nerves, are of first importance in deciding this question. In the case of bones broken by a bullet or small shell fragment, with small apertures of entrance and exit, these latter are dealt with on the lines already laid down for such wounds. Splints are applied, and the case is treated by the methods applicable to simple fractures. If, however, there be extensive comminution, with loose fragments torn from their periosteal attachment, with extensive laceration of soft parts, or with the missile retained, the site of the fracture is to be explored. The wounds of the soft parts are dealt with by free excision and thorough cleaning as already described. Loose fragments of bone are removed from the neighbouring muscles into which they have been driven. The surgeon must now decide whether he will close the wound at once—primary suture—or whether he will leave it open temporarily with the intention of performing a delayed primary suture, or, in case infection supervenes, secondary suture. He will be guided in this by the amount of soiling of the wound, the length of time which has elapsed before he is able to operate, and the extent to which anatomical considerations have allowed him to excise damaged tissue—the potential source of infection. Speaking generally, wounds of the upper extremity are more favourable for primary suture than those of the lower. Splinting must be so carried out that ready access may be obtained to the wound without disturbing the site of fracture. If possible, as in a well-equipped hospital, *x*-ray examinations should be made from time to time in the ward, to ascertain that the fragments are in satisfactory position.

Wounds of Joints.—Through-and-through wounds of joints, with small clean apertures of entrance and exit, and similar wounds caused by tiny shell fragments, may be treated by immobilization of the joint until healing is complete. This is followed by movement and massage. Where, however, there is a lacerated wound communicating with the joint, or where a foreign body is retained, immediate operation is necessary. A tourniquet having been applied, the wound leading to the joint is carefully excised, the damaged edges being completely removed, down to and including the opening through the synovial membrane. The same procedure is adopted at the aperture of exit. The joint is sufficiently widely opened to enable any broken or grooved part of the articular end to be dealt with. It is necessary that the surface of any damaged area of bone should be thoroughly removed. Where a foreign body is retained, the excision of the wound must of course include its removal. The joint is cleared from blood-clot, and then the wounds are completely closed in layers, the synovial membrane being carefully

adjusted. Drainage, if thought necessary, is limited to the superficial layers. A tube should never be inserted into the joint cavity. If infection takes place, the joint is laid open by long incisions. If tubes are used at all it must only be to keep the superficial part of the wound open. Voluminous dressings are applied, and the joint is immobilized in such a way that they may be changed without disturbance. If, in spite of free drainage, the septic processes continue to advance, amputation must be considered without undue delay.

Wounds of the Skull.—These injuries are often immediately fatal. With the modern military rifle the bullet may completely traverse the skull, leaving apertures of entrance and exit. Revolver bullets or shell fragments often remain within the cranial cavity. The amount of skull damage, the position of the foreign body, and the presence of in-driven bony fragments should be estimated by *x*-ray examination. Operation is necessary, the apertures of entrance and exit equally needing treatment. Local anæsthesia should be employed unless the patient be restless or struggling. The scalp wound is completely excised, the skull aperture is enlarged by forceps, or a piece of skull removed sufficiently large to include the damaged area. In-driven fragments of bone and foreign bodies are extracted. The wound is then closed completely, drainage being provided at an angle of the wound remote from the opening in the dura. Should the missile have ploughed a groove in the skull without penetrating the cavity, it is still necessary to operate, since the inner table will be found extensively splintered.

Wounds of the Chest.—Immediate operation is needed: (1) When there is a wound communicating with the pleural cavity through which air passes in and out with respiration (as a measure of first aid in such a case the insertion of two or three silkworm-gut stitches to stop the leak by bringing the skin and muscle together gives immediate relief); (2) When there is a large lacerated wound of the soft parts; (3) When a large foreign body is retained. The operation consists in a careful excision of the parietal wound, followed by complete closure. Where a foreign body is retained or fragments of rib are driven into the pleural cavity, the chest is opened widely, with removal of sufficient length of rib to enable the hand to be introduced if necessary. Foreign bodies and blood-clot are cleared away; tears of lung may sometimes be sutured. The parietal wound is then completely closed. The pleura is united if possible; failing this, the muscles or even the skin must be made use of to get an airtight pleural cavity. Repeated aspiration is employed afterwards to prevent accumulation of fluid. Where a bullet or small fragment of shell has left a small clean parietal wound, operation is contra-indicated. Hæmothorax in such a case, if large, is dealt with by aspiration (preferably with oxygen replacement) on about the seventh day. Small blood collections may be left to absorb. Careful watch is maintained for the onset of sepsis, and bacteriological examination of the pleural contents is the surest means of obtaining early evidence of this. If it occurs, immediate treatment is called for. The pleural cavity is laid freely open; all infected blood and clot and foreign bodies are removed, the hand being introduced if necessary. If the general condition of the patient is bad, and the infection of a serious nature (streptococci are especially unfavourable), temporary drainage must be employed. Otherwise the wound is completely closed, repeated aspiration being needed afterwards to keep the pleural cavity empty. In grave cases of infection a rapid opening of the pleura with insertion of a drainage tube is all that is feasible.

Wounds of the Abdomen.—In civil practice these wounds are treated as other penetrating abdominal wounds. When the condition of the patient permits, the abdomen is opened immediately and the damage to the viscera is repaired. It must be remembered that multiple visceral injuries are the rule, and it is therefore necessary to make a thorough exploration of the abdominal cavity. Wounds of the stomach are sutured, care being taken to ligature divided vessels in the neighbourhood. Wounds of the intestine are closed by suture, resection being avoided if possible; mesenteric bleeding is arrested. Badly lacerated wounds of kidney or spleen call for removal of the organ. Lacerated wounds of the liver can sometimes be dealt with by suture, but often plugging has to be employed; a large missile retained in the liver substance should be extracted. Wounds of the intraperitoneal surface of the bladder can usually be sutured satisfactorily; the extraperitoneal surface is difficult of access, and wounds of this part should be treated by free drainage along the track of the missile. In any case the wound of the abdominal

wall should be treated on the general lines already laid down. When the wound is caused by a small missile, and it is clear that the damage is limited to a solid viscus, operation is usually contra-indicated. (*See also* ABDOMINAL INJURIES.) *S. Maynard Smith.*

HABIT SPASMS IN CHILDHOOD.—(*See* TICS.)

HÆMATEMESIS.—The indications for treatment here are : (1) *To arrest the bleeding ;* (2) *To counteract its effects ;* (3) *To prevent recurrence.*

The patient should be kept very quiet, with the head low, in a cool room, and without too many bedclothes. An ice-bag may be applied to the epigastrium, and a hot-water bottle to the feet. Strict attention should be paid to the hygiene of the mouth. An immediate hypodermic injection of $\frac{1}{4}$ or $\frac{1}{3}$ gr. of morphia with $\frac{1}{40}$ gr. strychnine should be given. All styptic drugs are useless, and calcium salts do not act rapidly enough to be of service in stopping a profuse bleeding, though they are of some value in continued oozing or to prevent recurrence.

If the bleeding is not due to portal congestion, and the stomach remains distended, lavage with tepid water may be tried cautiously, provided it does not cause retching. A solution of adrenalin (1 drachm to 1 oz. of 1–1000 in 2 to 5 oz. of water) may be run in afterwards.

If the patient be very exsanguine, the foot of the bed should be raised, the limbs bandaged, and a tight abdominal binder applied. Normal saline should be given by the rectum or transfusion carried out, a watch being kept on the blood-pressure during the process to prevent too rapid a rise. Transfusion should not be delayed too long, as it is the most powerful means of overcoming the effects of the hæmatemesis (*see* TRANSFUSION).

If the bleeding persists or recurs, 10 c.c. of sterile serum (normal horse serum or anti-diphtheritic serum) should be given subcutaneously every six hours for one or two days. The preparation known as hæmoplastin (Parke, Davis) may be used for the same purpose.

Operation should not be resorted to during the continuance of the bleeding ; but if the hæmatemesis is the result of a *chronic gastric or duodenal ulcer*, operation should be performed as soon as possible after the patient has rallied from the loss of blood, transfusion being performed first if necessary. In the hæmatemesis of young women (gastrostaxis), and in that which results from hepatic cirrhosis or arteriosclerosis, operation is contra-indicated.

For three days after the occurrence of the bleeding all food by the mouth should be withheld, and a pint of normal saline given by the rectum every eight hours. Nutrient enemata are unnecessary. For the subsequent dietetic treatment, *see* GASTRALGIA *and* DUODENAL ULCER. *Robert Hutchison.*

HÆMATURIA.—Hæmaturia is a symptom of many diseases of the urinary organs. Before embarking upon the treatment, it is necessary to diagnose the source and the cause of the hæmorrhage. A short note will therefore be made as to the means of localization and diagnosis.

Localizing Symptoms.—The presence of one or more of the following symptoms points to the kidney as the source of the hæmorrhage :—

Severe pain in one kidney, renal colic, tenderness of the kidney, enlargement of the kidney, blood well mixed throughout the urine and 'smoky', long worm-like clots, the presence of tube casts and renal cells.

The following symptoms point to the bladder as the source : Pain at the end of the penis, suprapubic pain, frequent micturition, difficult micturition, bright blood in small quantity, initial or terminal hæmaturia, large irregular clots, the presence of bladder epithelium.

There are some fallacies in the symptomatology that may mislead the surgeon : Aching in one kidney may be caused by disease of the bladder, such as papilloma. Bilateral renal aching may be due to disease of the kidneys or to disease of the lower urinary tract. Frequent micturition may be reflexly caused by some diseases of the kidney when the bladder is healthy.

In many cases of hæmaturia there are no localizing symptoms. In these and in all cases where any doubt exists, the bladder should be examined with the cystoscope. By this means the source of the hæmorrhage will be localized to the bladder or the kidney, and, if the former organ is the seat of disease, a diagnosis will be made.

Severe symptomless hæmaturia from the kidney is most frequently due to renal growths, or to subacute or chronic nephritis ; angeioma of a renal papilla has been described. Other causes of renal hæmaturia usually accompanied by symptoms are injury, stone, pyelonephritis, and tuberculosis.

The most frequent cause of symptomless hæmaturia from the bladder is growth, which may be simple or malignant.

Other causes of vesical hæmaturia accompanied by symptoms are: cystitis, tuberculous cystitis, stone, enlargement of the prostate.

Treatment of Renal Hæmaturia.—Hæmorrhage from the kidney necessitates, in moist cases, operative measures for diagnosis or for treatment. Where operation is contra-indicated, or postponed, treatment by drugs becomes necessary. Opium is useful in cases of renal hæmorrhage of a surgical nature. It should be avoided where there is advanced disease of both kidneys, as there is a danger of causing suppression of urine.

Ergot may be given hypodermically as ergotine, or by mouth as the liquid extract. The results are frequently disappointing. Calcium lactate (10 to 15 gr. every four hours) is a more valuable drug. It may cause rapid cessation of a severe renal hæmorrhage. It should not be continued for longer than forty-eight hours. Washing the renal pelvis through a ureteric catheter with nitrate of silver solution (1–10,000), or the injection of a few drops of adrenalin have been tried. In most of these cases, however, the diagnosis is still in doubt, and it is better to explore the kidney by operation.

The operative treatment in renal hæmaturia varies with the disease.

In renal growths nephrectomy should be performed whenever a diagnosis has been made, unless the growth be too advanced for radical treatment. Operation in some of these cases takes the form of an exploratory laparotomy, with a subsequent nephrectomy if the conditions are found suitable.

Conditions such as localized patches of nephritis, and angeioma of a renal papilla, are diagnosed only on exploration of the kidney. Nephrotomy usually causes the hæmaturia from a patchy nephritis to cease, and the removal of the papilla has similarly cured hæmaturia due to angeioma.

In *rupture of the kidney*, the side should be strapped and an ice-bag placed over the organ. Should the hæmorrhage continue, the kidney must be exposed and dealt with according to the conditions found. The hæmaturia of stone is treated by nephro-lithotomy. In pyelonephritis with hæmaturia, nephrotomy should be performed, and usually suffices to relieve the symptoms; nephrectomy is sometimes necessary.

In *renal tuberculosis*, where nephrectomy is considered inadvisable, an attack of severe renal hæmorrhage may necessitate nephrotomy.

Drugs have even less effect on vesical than on renal hæmorrhage. Washing the bladder may become necessary in cases of hæmorrhage from growths or from enlargement of the prostate.

The patient should be recumbent. If the urethra is sensitive, 20 min. of novocain solution (4 per cent) should be instilled into the posterior urethra by means of a Guyon's syringe. A catheter of as large a size (*see below*) as the urethra will admit is gently passed into the bladder, and the bloody urine is withdrawn. The washing fluid may be introduced either from an irrigator raised two or three feet above the level of the patient, or by means of large glass hand-syringes, and a large total quantity should be used. The best solution is weak nitrate of silver (1 in 10,000 or 15,000). The bladder should not be fully distended with the fluid, only a few ounces being run in and out at a time.

In persistent, slight bleeding without clotting, a continuous stream of this solution through a double-way catheter may be successful when other methods have failed.

Weak solutions of suprarenal extract are not very effective. Hæmorrhage will sometimes be stanched by emptying the bladder and injecting half a drachm of strong solution of suprarenal extract (1 in 1000 or 2000) into the bladder, allowing it to remain for a few minutes, and then washing the bladder with boracic solution.

When clots are being formed they block the eye of the catheter and interfere with washing. The author's large-eyed flushing catheter (Weiss & Son) is suitable for the removal of clots and washing the bladder. To it may be fitted the rubber evacuating bulb used after litholapaxy, and by this means large clots may be removed. If, however, large clots are forming, and especially if the bladder has become distended with clot, suprapubic cystotomy should be performed, the clots cleared out, and a copious stream of hot fluid passed through a catheter in the urethra and allowed to well up through the suprapubic opening. A large tube is retained in the suprapubic wound for four or five days and then removed.

The removal of growths of the bladder, of stone, and enlarged prostate are the radical methods of treatment of hæmaturia due to these conditions.

Cystitis may necessitate suprapubic drainage of the bladder. The results of operative measures on tuberculous ulceration of the bladder are very unsatisfactory, and washing the bladder is almost invariably followed by renewed activity of the disease. Hæmorrhage is never so profuse in these cases as to necessitate local interference.

J. W. Thomson Walker.

HÆMOGLOBINURIA.—(*See* BLACKWATER FEVER; RAYNAUD'S DISEASE.)

HÆMOPHILIA.—In the case of a family who are known to be bleeders, prophylactic measures are of importance. Children should be protected from injury as far as possible, and no surgical operation of any kind should be undertaken, with the single exception of vaccination, which, if carefully performed, does not usually give rise to any trouble. If surgical procedure of any kind becomes absolutely necessary, the patient should be put on a course of chloride or lactate of calcium for a week or two before. It is often advised that the daughters of those families through whom the disease is transmitted should not marry, but this is a counsel of perfection which it is not always easy to carry out. Some family histories have recently been published in which the females and not the males have been affected, and in some of these the transmission has been through the male side of the house; while in at least one case there has been a reversal, the females having transmitted it in early generations, the males in later. As almost any injury, no matter how small, may cause fatal hæmorrhage in a bleeder, constant care and supervision may be required in cases which are known to be extreme, for all are not equally prone to serious hæmorrhage. A blow on a joint, for example, may cause serious hæmorrhage into it; or if elsewhere on the limb, there may be a great deal of subcutaneous bleeding. Such lesions are best treated by compression and complete rest.

Actual hæmorrhage may be traumatic or spontaneous. The latter is almost always from the mucous surfaces, though in bad cases a slight unnoticed blow or strain will often cause bleeding into joints or muscles, which may be described as spontaneous. In the former case, the patient must be kept at rest, and pressure on the bleeding point is the most useful procedure. Styptics, such as iron and adrenalin, may be tried, but are very often only temporarily of service. The application of cold, either by ice or ethyl chloride, is sometimes useful. A 5 per cent solution of gelatin has been tried, both locally and by subcutaneous injection, but has rather fallen out of use, toxic symptoms having followed its employment, and disaster from imperfect sterilization. Chloride of calcium may be given internally, and applied locally also, but is not of much service. Spontaneous hæmorrhages are very often preceded by a sensation of well-being, and when this sensation is experienced it seems to be worth while to let the patient take a mild saline purgative. When the hæmorrhage occurs, if the bleeding point can be reached, the same local applications should be made as in traumatic hæmorrhage. Chloride of calcium has been advocated because of its tendency to increase the coagulating power of the blood, which is so markedly deficient in hæmophilia. It is very doubtful whether a sufficient amount of lime can be added to the blood to affect coagulation. It may be given in large doses (15 to 30 gr.) by the mouth, three times a day, and this may, if necessary, be supplemented by its use per rectum in doses of 60 gr. in solution. The great disadvantages of this drug, however, are its tendency to upset the digestion, and its nauseous taste. It should, therefore, only be pushed in large doses when there is urgent need for it. When given, as it sometimes may be, in short courses to anticipate bleeding, the dose should be much smaller. Lactate of calcium, in doses of 20 to 60 gr., has been advocated instead of the chloride, alone or with equal quantities of magnesium carbonate. It seems to be as efficacious, and has the advantage that it does not upset the digestion. It should be given an hour before meals. I have tried calcium chloride intramuscularly without any effect in stopping the hæmorrhages. Other internal styptics may of course be tried, such as ergot, turpentine, hamamelis, and adrenalin, but too often they all fail in turn. The best results, in my experience, are obtained from serum treatment. Fresh serum from the horse, rabbit, or man may be used, but not ox serum, as it may cause headache, vomiting, rigors, and cyanosis. The serum may be given by the mouth, but is very much more useful when

administered hypodermically or intravenously. The last method is best in those severe cases in which a hypodermic or intramuscular injection gives rise to a hæmatoma, which is very apt to happen. The dose is 20 to 30 c.c. hypodermically, or 10 to 20 c.c. intravenously—correspondingly smaller doses are given to children. Fresh serum is always best, but the normal horse serum prepared by manufacturing chemists is also useful if fresh serum cannot be obtained, and in an emergency ordinary antidiphtheritic serum may be used. The effect of serum injection lasts about a month, and I have succeeded in keeping patients free from hæmorrhage for many months by giving regular injections intravenously once a month. Anaphylactic symptoms very rarely occur in these cases, but when a course of intravenous serum treatment is started, it is well to make the first dose a small one, say 5 c.c., and increase the dose in later injections.

Subcutaneous injection of 10 c.c of a 5 per cent solution of Witte's peptone in 5 per cent salt solution, given every second day, has been recommended. Injection of emetine ($\frac{1}{2}$ gr. hypodermically) has recently been highly spoken of, and is worth trial in continued bleeding.

Loose clots should always be removed from a wound or bleeding surface, and bleeding surfaces should be soaked with a strong solution of thrombokinase in the form of an extract of lymph-gland or thymus, or even with fresh human blood from another person.

After a hæmorrhage the patient is naturally very much reduced, and will usually require rest, iron, and general tonic treatment. In some cases the tendency to bleeding diminishes later in life. *G. Lovell Gulland.*

HÆMOPTYSIS.—The cause of the bleeding must be first determined. In the larger proportion of cases it is an incident in the course of pulmonary tuberculosis. It also frequently occurs in other congestive conditions of the lung, notably passive congestion associated with mitral stenosis. Less frequent causes are bronchiectasis, pulmonary gangrene, malignant disease, hydatids, syphilis, pulmonary embolism or thrombosis, and atheroma (aneurysm). It may occur in relation to various morbid blood conditions, and is sometimes apparently dependent upon menstrual irregularity. Vicarious menstruation—it may be supplementary menstruation—certainly occurs.

Where there is reasonable ground for doubt as to the origin of the bleeding, it is a safe rule, from the point of view of treatment, to regard it as most probably a manifestation of tuberculous involvement. Occurring in pulmonary tuberculosis, it varies both in origin and clinical manifestation. Thus, in the early stage, it may simply be an expression of capillary oozing from a congested area. This is relatively unimportant. Later on, it is more likely due to ulceration of a considerable branch, or rupture of an aneurysmal dilatation of a vessel in relation to a vomica. This is more serious, and may prove fatal.

All cases of hæmoptysis do not require special treatment. Thus, in mitral stenosis, assuming that the primary condition has been attended to, e.g., by digitalis, the hæmorrhage may be actually beneficial, and is best left alone. Attempts to stay it may be positively unwise. Nature's attempt at depletion should be rather encouraged, e.g., by the application of a leech or cup over the base of the lungs. In rupture of an aneurysm of the aorta, treatment is of little avail.

In slighter degrees of bleeding in pulmonary tuberculosis—mere coloration of the expectoration—little need be done beyond insistence on hyperaeration and other hygienic measures. It is remarkable how seldom bleeding recurs when open-air measures are sufficiently carried out. (*See* PULMONARY TUBERCULOSIS.)

When the bleeding is considerable, the main indications are to calm the patient and promote clotting within the vessel by quieting the excited circulation and gently lowering pulmonary blood-pressure.

The first thing to be done in most cases is to reassure the patient and his friends. The patient's fears will be best allayed by his knowing that the bleeding is not generally dangerous. Thereby his disturbed circulation becomes steadied. Without fuss, he should be kept as quiet as possible. He should not be allowed to speak, and the fewer friends about him the better. The room should be as fresh and cool as possible, and the patient's clothing light. If necessary, the feet can be kept warm by hot bottles.

The recumbent posture should be maintained, with the head more or less raised. The patient usually assumes the position which allows of freest discharge of the blood from

the air-passages. Theoretically, it is better that he lie on the side which is the seat of bleeding. Thereby the blood is less likely to pass into and block the bronchial passages of the other side. When the side is known, the patient's position may be arranged accordingly. It is a mistake, however, to examine him much for the determination of this.

He should not be bothered with food, which, for the first twenty-four hours, may be reduced to a minimum. He will not suffer from starvation. What food is given may take the form of milk, which may be iced, or of meat jellies. Alcohol should be excluded. Thirst, which is sometimes marked, may be assuaged by the use of iced lemon and water, or dilute sulphuric acid in water. This is generally better than sucking simple ice, which is apt to disturb the stomach.

As soon as possible an opiate should be administered—say morphine $\frac{1}{6}$ to $\frac{1}{3}$ gr. This has the double advantage of calming the patient's excitement—perhaps sending him into a gentle sleep—and restraining cough. The latter effect is most important, as repeated cough, by shaking the bleeding vessel, tends to prevent coagulation. In presence of persistent or recurrent bleeding, the regular exhibition of sedatives is on this account indicated. Except in very profuse hæmorrhage, opium may be given freely. Sometimes the addition to the morphine of atropine, $\frac{1}{100}$ gr., is of value. The combination of digitalis, $\frac{1}{4}$ to $\frac{1}{2}$ gr., with opium may be helpful, even although the significance of digitalis has been questioned because of its usual action in increasing blood-pressure. Tincture of strophanthus is sometimes helpful, when the lungs are congested.

To lower blood-pressure, the use of circulatory depressants is desirable. From this point of view ipecacuanha is most serviceable. The writer's experience is much in favour of this plan of treatment. Ipecacuanha should be given in comparatively small doses, say 5 gr., repeated every one or two hours. It is not necessary or desirable to produce emetic effects. The combination of ipecacuanha with opium, as in Dover's powder, 5 gr., repeated similarly, will be found efficient. Or emetine may be given—preferably by subcutaneous injection—say, emetine hydrochloride $\frac{1}{6}$ to $\frac{1}{2}$ gr. Used with care, it may prove successful when other measures have failed.

Small doses of mercury are of excellent service, and may be exhibited along with ipecacuanha and opium, as in the following formula, which the writer strongly recommends :

℞ Pulveris Ipecacuanhæ Co. gr iv | Hydrargyri cum Creta gr j

For use every two to four hours while bleeding continues.

It is sometimes advisable to give a larger dose of calomel—say 5 gr. at once.

From the same point of view, the inhalation of amyl nitrite may prove serviceable in patients with a tendency to recurrent bleeding of large amount. It may be wise to let the patient carry about capsules of the drug. Its use should be restricted to severe bleeding, more particularly where the blood-pressure is definitely high. To meet the tendency to slighter hæmorrhages in presence of sustained high pressure, the more continuous use of small doses of nitroglycerin, or nitrite of sodium, may be serviceable.

The patient may advantageously take a saline purge, say magnesium sulphate or sodium sulphate, either singly or combined (1 to 2 drachms). This may be repeated several times, at intervals of three hours. Where the blood-pressure is unusually high, ½-min. doses of tincture of aconite, repeated every hour for a few doses, may prove of the greatest value. Experimental observations go to show that aconite exerts an important influence in lowering pulmonary blood-pressure. Venesection has been proposed from the same point of view, but the number of cases in which this is necessary are extremely few.

If the bleeding be severe, the application of ice to the chest by means of an ice-bag may be allowed ; as a rule it is not necessary or even desirable. The application of ice to other parts, for example over the external genitals, may sometimes prove advantageous. Tight bandaging of the thighs and upper arms, e.g., by means of Esmarch's tubing, has been practised, with a view to limiting the return of blood to the lungs. This may be worth trying in the graver fulminant cases, as when an aneurysmal dilatation has given way ; generally it is unnecessary.

Numerous other drugs have been from time to time proposed, and some of these have obtained considerable reputation on insufficient and even doubtful grounds. Thus, ergot, which is still too largely used both by the mouth and subcutaneously, has little to recommend it. Experimentally it has been proved to lead to a rise in pulmonary blood-pressure

and the sum of clinical experience is against its use. Nor can suprarenal extract or its active principle, adrenalin, be recommended. Pituitary extract, which has been used especially by the intravenous method, would seem open to the same criticism.

Various astringents have been favoured, e.g., gallic acid, tannin, and lead. They are probably valueless. Acetate of lead has been much praised in combination with opium. The probability is that the lead has little effect on the bleeding.

With the object of hastening coagulation, certain hæmostatic drugs have been proposed, more especially chloride of calcium, or lactate of calcium (pleasanter to take), 10 to 20 gr., thrice daily. Satisfactory results are frequently obtained.

Of other hæmostatics, turpentine and its congeners terebene and terpene, and eucalyptol in large doses, are sometimes of service. The repeated use of small doses of terebene, 5 to 10 min., or 3 gr. of terpene hydrate three times a day, seems to reduce the tendency to recurrent bleeding. Tincture of hamamelis, 30 to 60 min., has been thought worthy of trial, although it is open to the same experimental objection as ergot. The old-fashioned domestic remedy of common salt, 1 or 2 teaspoonfuls, may be used when other agents are not available.

When bleeding is severe and recurrent, the induction of artificial pneumothorax may prove successful. The procedure presupposes knowledge of the seat of bleeding and adequate function of the other lung. (*See under* PULMONARY TUBERCULOSIS.)

After acuter manifestations have disappeared, the patient must be careful of himself in a number of ways. He should be kept at rest, as far as possible, till all blood-stained discharge has disappeared. The diet should continue to be simple and non-stimulating. Alcoholic liquors should remain excluded. Hæmatinics—iron and arsenic—should be given with caution, or not at all. The patient must avoid sudden effort and violent exercise, e.g., dancing, strained speaking, or singing. There must be no excess of any kind. Women should be especially careful in relation to the menstrual period, when sufficient physical rest should be insisted on. A mustard foot-bath may be advantageously used for a night or two before the menses are due. The bowels should be carefully regulated, so as to prevent constipation.

The treatment of the initial disease, more particularly pulmonary tuberculosis, must be carefully prosecuted on the lines discussed under the appropriate heading. (*See also* HEART, VALVULAR DISEASES OF; PULMONARY TUBERCULOSIS, etc.) *R. W. Philip.*

HÆMORRHAGE, CEREBRAL.—(*See* APOPLEXY.)

HÆMORRHAGE, INTESTINAL.—(*See* DUODENAL ULCER.)

HÆMORRHAGE, INTRACRANIAL.—Hæmorrhage into the cranial cavity occurring as the result of injury may be classified according to the site of the extravasated blood. From the point of view of treatment, however, the chief question to be determined is whether the blood is between the dura mater and the bone, or within the dura.

Extradural Hæmorrhage.—In the very great majority of cases the source of the blood is the anterior branch of the middle meningeal artery—occasionally it may be one of the venous sinuses or the posterior branch of the middle meningeal which bleeds. If, after the receipt of a blow on the head, the patient recovers consciousness, and then after an interval (usually less than an hour) symptoms of compression ensue—gradually increasing and steadily progressing to coma—extradural hæmorrhage may be diagnosed.

TREATMENT.—The general treatment needed is given under the heading of BRAIN, COMPRESSION OF. The chief essential, however, is the early localization of the site of the extravasation, in order that operative measures may be taken. In a patient, then, with the general symptoms of compression from extradural hæmorrhage, the following conditions are to be looked for :—

1. Where there is a scalp wound, a fissured fracture with blood welling from it may be seen crossing the line of the middle meningeal artery or of a venous sinus, and indicates injury to the vessel at that spot.

2. A hæmatoma developing in the temporal fossa suggests injury to the middle meningeal on that side.

3. Hemiplegic symptoms indicate the anterior branch of the middle meningeal artery of the opposite side as the source of the hæmorrhage.

4. Absence of hemiplegic signs suggests that one of the venous sinuses or the posterior branch of the middle meningeal artery is the source of the bleeding.

5. Protrusion of the eyeball with a widely-dilated fixed pupil indicates that blood is finding its way round to the base of the skull, and that its probable origin is the anterior branch of the middle meningeal of the same side.

6. Where there is doubt, the history of the part struck and the presence of a bruise may aid the diagnosis.

If it be decided that the *anterior branch of the middle meningeal artery* is the source of the hæmorrhage, a flap is turned down ; and if a fracture be found, a disc of bone is removed with the trephine where the line of fracture crosses the line of the artery. Should no fracture be detected, the pin of the trephine is placed upon a point 1½ inches behind the external angular process of the frontal bone and 1½ inches above the zygoma. The cranial cavity having been opened, the blood-clot between the bone and dura is washed away by a stream of hot sterilized saline solution. The bleeding artery is secured by passing a ligature around it, or by plugging the bony canal in which it lies with aseptic wax. A drainage tube is inserted and the wound closed.

If it be found that the blood comes from *one of the venous sinuses*, a trephine hole is made over the sinus and enlarged with Hoffman's forceps until the bleeding point is exposed. If the tear of the sinus is accessible it should be closed by a 'postage-stamp' graft. This may be cut from a neighbouring portion of the occipitofrontalis aponeurosis or from the deep fascia of the leg, care being taken to obtain muscle fibre on the deep surface. Such a graft, held over the rent in the sinus wall, will usually adhere after a few minutes. If this measure fails or is inapplicable, the bleeding must be controlled by strips of gauze, which are removed on the third day.

Intradural Hæmorrhage.—The symptoms will be those of concussion, rapidly merging into those of compression, usually without any return of consciousness. The extravasation of blood may be from one of the venous sinuses, but is usually dependent upon the rupture of vessels in a laceration of the brain. Intradural hæmorrhage often occurs in fractures of the base of the skull.

Treatment.—For the general treatment *see* Brain, Compression of. Sometimes the site of the lesion may be localized by keeping a careful watch for the onset of spasm and rigidity in the muscles, of convulsions, and of paralysis. If so, the suspected area may be exposed. A flap of scalp is turned down, and the skull is opened with a trephine. The dura mater, if there be bleeding beneath, will bulge into the trephine hole and present a dark-blue appearance. The dura is incised, the clot turned out, and the bleeding vessels are secured, if possible, with ligatures ; otherwise the source of the bleeding, should it be accessible, is packed with sterilized gauze.

More frequently, however, the symptoms are those of generalized compression, and are due to extensive basal extravasations. If the symptoms of compression are slight, and are limited to drowsiness and restlessness with slight slowing of the pulse and raising of blood-pressure, treatment may be expectant. But if symptoms are severe from the start, or increasing in severity, no time is to be lost before opening the skull. The best chance of saving the patient lies in a rapidly performed decompression operation. A flap is turned down in the temporal region on the suspected side. The temporal fascia and muscle are divided in the direction of their fibres, and with a trephine and forceps an area of bone is removed about 1½ inches in diameter. The dura is opened and clot turned out. The brain is gently lifted to liberate any basal collections, and rubber drainage strips are inserted. The fascia, muscle, and skin are closed in layers. Both sides must be opened if a unilateral operation fails to give relief. *S. Maynard Smith.*

HÆMORRHAGE, UTERINE.

A.—ANTE-PARTUM HÆMORRHAGE.

Carcinoma, mucous polypi, and erosions of the cervix may cause slight bleeding during pregnancy, but severe bleeding during the last three months of pregnancy comes from the placental site and is due to partial detachment of the placenta. There are two

varieties: (1) Hæmorrhage due to the detachment of a normally-situated placenta is known as *accidental hæmorrhage*; (2) Hæmorrhage due to detachment of a placenta prævia is known as *unavoidable hæmorrhage*.

1. **Accidental Hæmorrhage.**—This is very rarely due to an accident (blows or falls) as its name might imply. Its association with albuminuria and other symptoms of toxæmia of pregnancy is so constant that there can now be no doubt of its toxæmic origin; necrotic changes in the placental decidua and its blood-vessels lead to retro-placental hæmorrhage, which may be the starting-point of detachment of the placenta over a wide area. Accidental hæmorrhage may be (*a*) external, (*b*) internal or concealed; the two varieties are often combined.

No one method of treatment is applicable to accidental hæmorrhage, and few conditions more suit the platitude that "each case must be treated on its merits". In general terms the method of treatment will depend on the slightness or severity of the bleeding, on the presence or absence of labour pains, on the degree of dilatation of the cervix, and on whether the bleeding is external or concealed. Cases of external hæmorrhage may be considered under the headings of slight, moderate, and severe; concealed hæmorrhage, which is nearly always severe, is in a class by itself.

Many cases of external hæmorrhage are extremely slight and require no active treatment. If the patient is kept in bed and given sedatives, the bleeding will probably stop and the pregnancy go on to full term; keep a watch on the general condition, on the pulse-rate, and on the state of the uterus, to exclude concealed hæmorrhage. Always examine the urine, and give appropriate treatment if there is albuminuria.

Cases of moderate severity are those where the bleeding is too profuse to justify temporizing measures, yet not sufficient immediately to endanger life. The treatment depends essentially upon whether the patient is in labour or not. In most cases of accidental hæmorrhage, where there have been one or more free losses of blood, labour comes on spontaneously, though the pains when the patient is seen are feeble and infrequent. The object of treatment in these cases is to excite vigorous labour pains; the blood is coming from the active upper uterine segment, and the bleeding is nearly always controlled when strong labour is established. If, then, the patient is in labour and the cervix is dilating, rupture the membranes, apply a firm binder, and inject pituitary extract (1 c.c.) or ergotine. When vigorous labour pains have thus been induced, there is little or no fear of further hæmorrhage. Should hæmorrhage continue, complete dilatation of the cervix with the hand, or hasten it by the introduction of a hydrostatic bag, and deliver with forceps. But avoid violent and hasty methods of delivery, for, let it be repeated, there is hardly ever any cause for hurry when labour has once set in.

If the uterus is not acting, the case is much more dangerous. Rupture of the membranes is to be avoided, for it lowers intra-uterine pressure and encourages bleeding. Forced delivery by manual or instrumental dilatation of the cervix or by version will probably kill the patient. The best treatment here is to plug the vagina, apply a firm binder, and inject pituitary extract or ergotine. Plugging, if properly carried out, will arrest the bleeding in about 90 per cent of cases, but it is not infallible. Half-hearted plugging is useless. An anæsthetic, an assistant, the lithotomy position, and rigid asepsis are essential. Better directions cannot be given than those of Hastings Tweedy: "To plug efficiently, the left hand should be passed into the vagina with the palmar surface directed towards the hollow of the sacrum, while the tips of the fingers lie behind the cervix. Small pieces of cotton-wool, squeezed out of lysol solution, and each the size of the thumb knuckle, are then taken and inserted by means of the right hand round the cervix. The fingers of the left hand are kept busy squeezing the pellets into a compact mass and forcing the spaces between them to permit the insertion of still another plug. This process is continued in a systematic manner from above downwards till the vulva is reached and the vagina can hold no more. A T-bandage is applied to keep the plug in position, and an abdominal binder is fastened tightly from above downwards to press the side walls of the uterus against the vaginal dam, and this completes the operation. A plug so applied will cause immediate cessation of hæmorrhage, and, when it is removed after the lapse of hours, so much blood only will be found as can be accounted for by the flow which took place during the operation. The vaginal plug is not easy to apply, nor is its application harmless. Sometimes, in spite of our best efforts, we cannot at the first

attempt insert sufficient material to stop the bleeding. In such cases the plug must be removed entirely and reinserted. On the second attempt the procedure will be found to have become much more easy on account of the dilatation of the vagina". Pain and a certain amount of shock always follow the application of the plug, and these must be relieved by morphia. The plug acts partly by exciting labour pains, but principally by exerting pressure on the uterine arteries. The plug should be removed a few hours after labour pains have begun, for it will obstruct delivery if left in too long.

In cases where the hæmorrhage is severe, there are usually no labour pains and no dilatation of the cervix, for hæmorrhage is not likely to be severe if the uterus is active. The treatment for severe cases is the same as that already given for moderate, with the additional warning that hasty delivery will be surely fatal in an already collapsed patient. A vaginal plug, and injections of pituitary extract repeated four-hourly, will control the bleeding and tide the patient over the next few hours, during which time she must be treated for collapse and shock.

Where the necessary skill and surroundings are available, Cæsarean section is the best treatment for many cases of accidental hæmorrhage, especially when the patient is a primigravida and the cervix is closed. Spinal anæsthesia should be used in the presence of collapse, both because it tends to prevent shock, and because of its remarkable action in exciting uterine contraction.

In concealed hæmorrhage, which is one of the most dangerous complications known, the uterus is always inactive; in fact, temporary paralysis of the uterus is the essential reason why the blood is retained. The invariable presence of albuminuria and other toxæmic symptoms adds to the danger of the condition. Furthermore, in many cases there are interstitial uterine hæmorrhages and splitting of the peritoneal coat, and hæmorrhage into the peritoneal cavity.

The ideal treatment for severe concealed hæmorrhage is Cæsarean section, preferably under spinal anæsthesia. It is not necessary to remove the uterus, as it will always contract if given time and stimulation; nor do interstitial hæmorrhages impair its value as a future child-bearing organ. If Cæsarean section is not available, these cases must be treated by the vaginal plug and pituitary extract. Active treatment, by Cæsarean section or the vaginal plug, is not always necessary. In cases of moderate severity, nothing need be done beyond giving pituitary extract, the general condition and pulse-rate and the size of the uterus being carefully watched. Very often the general condition improves and labour pains start, a fact that is proclaimed by the appearance of external hæmorrhage, and the patient delivers herself safely. It requires great judgement to adopt this line of treatment, and it should only be done in the presence of all facilities for instant operative treatment if there are signs that hæmorrhage is progressive.

2. **Unavoidable Hæmorrhage.**—By this is meant hæmorrhage which is due to the partial detachment of a placenta situated in the lower uterine segment. When the placenta is prævia, partial separation of it, and consequently hæmorrhage, will inevitably occur with the onset of labour pains, and will be liable to continue at intervals during the whole of the first stage of labour. Labour may not set in until full term, but it is not rare for hæmorrhage to occur some weeks earlier. If in such a case nothing is done, repeated floodings will occur, and the patient may be reduced to a condition of profound anæmia before labour definitely begins. Whenever placenta prævia is diagnosed, labour must be induced without delay, as hæmorrhage is certain to recur. This is a rule that must never be broken. When the placenta is situated centrally over the os internum, the mother is placed in a position of grave danger. For such cases, if the necessary skilled assistance is available, delivery by Cæsarean section is the safest and best method of treatment, especially in the case of a primigravida. Furthermore, Cæsarean section is the only treatment that will save the child in cases of central placenta prævia.

More commonly, although the placenta covers the os internum, the membranes can be reached. When the cervix will admit two or more fingers, the principle of treatment of placenta prævia can be carried out; this principle consists in exerting continuous pressure on the detached placenta, either by the half-breech of the fœtus or by Champetier de Ribes' bag. If the cervix is not sufficiently dilated, the requisite dilatation must first be made, either by using Hegar's dilators, or by firmly plugging the cervix and vagina and applying a firm abdominal binder. The plug excites pains and may be removed in

six or eight hours, by which time the cervix will be sufficiently dilated to allow of further manipulation. On the whole, the half-breech is the safer method for the mother, whereas the fœtal mortality is slightly lower with the bag. The half-breech is a more effective means of obtaining pressure, and gives complete control over labour. If the bag is used, the patient is liable to bleed when it comes away, unless the presenting part descends rapidly of its own accord or is brought down artificially; bags are liable to displace the presenting part, they deteriorate by keeping, and sometimes burst at critical moments. Bringing down the half-breech is the method to be preferred. If the fœtus is presenting by the breech, all that it is necessary to do is to introduce two fingers through the cervix and bring down a foot. If the membranes are intact, they must naturally be ruptured; if the placenta covers the os internum, an attempt must be made to reach the membranes at one side of the placenta, but if they are out of reach the placenta must be deliberately bored through, taking care to disturb its attachment to the uterine wall as little as possible. The half-breech of the fœtus is then drawn firmly down so as to exert continuous pressure against the lower uterine segment and bleeding area during the rest of the stage of dilatation. If the fœtus is presenting by the vertex, it is best to perform external version, usually an easy manœuvre in cases of placenta prævia; it is then easy to bring down a foot by introducing two fingers through the cervix. If the fœtus cannot be turned externally, the foot should be brought down by performing bipolar version. Internal version is to be avoided whenever possible, for it has serious disadvantages; during its performance the placenta may become widely detached, the cord may prolapse, and sepsis may be introduced. There is no necessity to hasten the extraction of the child after the half-breech has been brought down. Slow delivery is the golden rule. If much hæmorrhage has already occurred, there is great liability to shock if the fœtus is too speedily delivered; the softened lower uterine segment and cervix tear very easily, and rapid delivery is dangerous also for the fœtus.

In cases of partial placenta prævia, where the patient is in labour and the os is already half dilated, if the tissues of the cervix are soft, manual dilatation and extraction by forceps may be employed.

Post-partum hæmorrhage is liable to occur, and is especially dangerous, in the case of a patient already depleted by ante-partum hæmorrhage. All means must be at hand for promptly dealing with hæmorrhage during the third stage.

B. POST-PARTUM HÆMORRHAGE.

This term is applied to cases of excessive bleeding after childbirth. It may be more accurately defined as a loss of twenty ounces or more, or of a sufficient amount to cause symptoms of loss of blood.

In the majority of cases the bleeding occurs from the placental site, and is due to uterine inertia. In other cases the blood comes from a deep tear of some part of the genital tract. Bleeding from both these sources at the same time may sometimes be met with. Hæmorrhage from a tear may generally be readily diagnosed by the fact that in these circumstances the uterus is found to be firmly contracted. The treatment of the two conditions is obviously different.

1. Hæmorrhage from the Placental Site.—The object of treatment in this case is to excite efficient contraction and retraction of the uterus. If the placenta has not yet come away, the first thing to do is to endeavour to express it, after having excited a contraction by kneading it. If this cannot be done, the placenta must be removed by the gloved hand introduced into the uterine cavity.

When the uterus is empty, the ordinary methods of exciting contraction and retraction, and thus checking the bleeding, are: (*a*) Kneading the uterus by the hand on the abdomen; (*b*) Irrigation of the uterus with hot lotion; (*c*) The administration of ergotine or pituitary extract.

To knead the uterus efficiently, the fingers of the left hand should be placed behind the fundus, and the thumb in front. By movements of friction and squeezing between the fingers and thumb a contraction can generally be excited. If relaxation and further bleeding occur, the uterus must be irrigated with hot lysol or iodine lotion at a temperature of 118° (strength, one teaspoonful to the pint). This is best introduced into the uterine cavity by means of a long tube and irrigating apparatus. Plenty of hot lotion is

required. If a thermometer is not handy, the heat of the water may be fairly accurately ascertained by means of the hand. Water at a temperature of 118° feels uncomfortably hot, though not too hot to permit the hand being held in it. To avoid the mischance of scalding the patient, the water should always be tested in this manner by thrusting the hand deeply into the douche-can, as in the hurry of the moment the temperature registered by the thermometer may be inaccurately read by the nurse. An injection of ergotine or of pituitary extract into the muscles of the outer side of the thigh should be given, provided that the placenta has come away or been removed.

These methods of treatment, separately or in combination, check nearly all cases of post-partum hæmorrhage due to uterine inertia. In exceptional instances they may prove insufficient. In such circumstances bimanual compression of the uterus must be employed. This is done as follows : With the patient preferably on her back and in the cross-bed position, place the right hand on the abdomen over the uterus and introduce the left hand into the uterus and rapidly clear out all clots and pieces of placenta and loose chorion. Then withdraw the hand from the uterus into the vagina. Clench the fingers. With the external hand, antevert the uterus and press it down on the internal hand, which generally lies in front of the cervix. Such pressure need not be very forcible, but it may be maintained if necessary for half an hour or more. Be sure that the uterus is emptied before bimanual compression is employed. In every case where the hand has been introduced into the uterus a copious intra-uterine douche must be given.

Compression of the abdominal aorta has been advocated in some cases where the bleeding is unusually profuse and sudden.

2. **Hæmorrhage from Tears.**—Tears which cause free external bleeding are nearly always situated either in the cervix or at the vaginal orifice.

A tear of the vaginal portion of the cervix does not usually cause much bleeding. If, however, it extends deeply into the supravaginal portion, it may cause great loss of blood. Such tears almost always occur laterally.

Tears at the vaginal orifice may be either anterior or posterior. The anterior tear extends into the vestibule, a vascular area at the side of the urethra. A posterior tear (perineal tear) is very common, but only in rare instances does it lead to serious bleeding.

Bleeding from lacerations is best treated by bringing the torn surfaces into apposition by deep sutures. The cervix can be easily sutured if it be first brought down by a volsella and thoroughly exposed by a large speculum. Bleeding from the perineum or vestibule can be stopped in a similar manner, and can be temporarily checked by pressing a pad of cotton-wool firmly against the bleeding area so as to compress it between the pad and the adjacent bone. If the bleeding comes from the cervix, and it is not practicable to suture it, hot vaginal injections may be tried, and if these fail the vagina may be firmly plugged. This must never be done unless the uterus is firmly contracted.

Perchloride of iron in any form should never be used to control post-partum hæmorrhage. *Eardley Holland.*

HÆMORRHAGIC DISEASE OF THE NEWLY-BORN.—The best remedy in this condition is human blood-serum or whole blood. The serum may be obtained by drawing off blood from a vein in the forearm into a sterile flask and using the serum as soon as it has separated. Ten c.c. may be injected subcutaneously, and repeated in six hours if necessary. As an alternative, whole human blood may be used, 5 c.c. being injected into the gluteus muscle. Sterile horse-serum may also be used (e.g. antidiphtheritic serum), 5 to 10 c.c. being given subcutaneously, and repeated in six hours if necessary, or the preparation known as hæmoplastin may be tried.

In bleeding from the alimentary canal, 1 drachm of a 5 per cent solution of gelatin may be given every hour with advantage, and one or two minims of a 1–1000 solution of adrenalin may be added to each teaspoonful with benefit. Milk should be stopped, and small feeds of water given instead at body temperature.

Bleeding from the umbilicus can usually be controlled by a ligature and pressure. If it persists, a long needle may be passed transversely under the umbilicus, and pressure exerted by a figure-of-8 of coarse silk wound round it. Hæmorrhage from mucous membranes may be dealt with by the local application of adrenalin. *Robert Hutchison.*

HÆMORRHOIDS.

External Piles.—These small swellings at the anal margin often cause a considerable amount of pain and discomfort, especially when swollen and inflamed, and the patient is obliged to lie up. As a rule the swelling and inflammation subside in a few days, but a recurrence of the condition is common, and some patients are very subject to these acute attacks. One of the most important factors in the treatment of external piles is to ensure cleanliness of the part. The patient should not use paper as a detergent, but wash the parts with warm water and a soft sponge, afterwards dusting them with boracic powder.

A mild aperient should be given, and, if there is much swelling, the patient should remain in bed and have hot fomentations applied. The following ointment applied to the swellings on a piece of lint will often effectually allay the pain :—

℞ Morphinæ Sulphatis gr. x | Unguenti Stramonii āā ℥j
Unguenti Belladonnæ

The most effectual method of treatment, and at the same time the best if it can be carried out, is to remove these external piles at once. This immediately gets rid of the pain, and materially shortens the time before the patient is well again. The parts should be rendered as surgically clean as possible, and then each swelling rendered anæsthetic by the injection of novocain 2 per cent at its base. The greater part of each swelling should then be cut away with sharp scissors and the contained clot shelled out. After this an antiseptic dressing should be applied firmly with a T bandage. On no account should a ligature ever be tied round these external piles, as the results are most disastrous, the patient suffering acute pain. A ligature is quite unnecessary, as hæmorrhage is easily controlled by pressure. Quite apart from their being inflamed, many patients suffer considerable discomfort from them, and when this is the case an operation for their removal is advisable.

Internal Piles.—The treatment may be divided into palliative and operative measures.

Palliative treatment is often all that is required in the milder cases, and if properly carried out may give most satisfactory results. This treatment consists in keeping the bowels regular, in correcting the diet, and in the local application of sedatives and astringents. Small doses of cascara combined with a morning dose of salts, or the confection of senna at bedtime, are useful. Drastic purgatives are harmful. The diet should be simple, and alcohol is better avoided, as also are coffee and strong tea. Moderate exercise, especially walking, is often most beneficial. Sitz baths several times a week are often of great service, and those who can afford it can have a sitz douche fitted in the bathroom which may be used daily. Much benefit is often derived from the use of hot or cold water injections into the bowel night and morning. For this purpose an eight-ounce rectal bulb syringe is much better than the ordinary Higginson's syringe. The water should be as warm as can be comfortably borne, or else quite cold, and some hazeline or alum may with advantage be added to it. A good injection is witch hazel 2 drachms, water 2 oz.

If there is any prolapse of the piles, the patient should be instructed to replace them immediately, and care should be taken to see that they do not get rubbed by the clothing.

All ointments to be used in the rectum should be prescribed in collapsible tubes to which a bone rectal nozzle can be screwed, or should be used with an ointment introducer; they should be made up with vaseline and not lard. The following ointment is often useful :—

℞ Unguenti Acidi Tannici | Unguenti Belladonnæ āā ℥ss
Unguenti Stramonii

M. Ft. ung. A little of this ointment to be squeezed into the bowel night and morning.

Hazeline ointment is also useful, and great benefit often follows the use of ointments or suppositories made up with adrenalin. It is not advisable, however, to use adrenalin compounds for long periods, recent researches having shown that they cause damage to the kidneys.

℞ Extracti Suprarenalis ℥ij | Unguenti Lanolini ℥vj
M.

℞ Acidi Tannici gr. xxx | Adipis Benzoati ℥j
M. Ft. ung.

Suppositories are much preferred by some patients on account of their convenience. The following will be found useful :—

℞ Ichthyolis
Acidi Tannici āā gr. v
Extracti Belladonnæ gr. ⅓
| Extracti Stramonii gr. ½
Extracti Hamamelidis gr. x
M. Ft. supposit.

℞ Extracti Suprarenalis ℥ij | Olei Theobromatis ℥iv
M. Ft. supposit.

The following mixture taken by the mouth is often useful in alleviating the pain and discomfort of bleeding and prolapsing piles :—

℞ Pulveris Cretæ Aromatici gr. xx
Tincturæ Catechu ℥j
| Decoctum Hæmatoxyli ad ℥j

When, however, bleeding and prolapse of the piles are frequent, palliative measures offer only temporary benefit, and a cure of the condition cannot be expected apart from operation. It is a mistake to advise such patients to try palliative treatment for long periods, as thereby they suffer much pain and discomfort, and ultimately an operation is necessary, which if performed earlier would have saved them great inconvenience.

Indications for Operation.—(1) Repeated hæmorrhages ; (2) Prolapse of the piles ; (3) Pain and discomfort ; (4) Failure of palliative treatment ; (5) Patient going to reside in a hot climate ; (6) If the patient is unduly worried as to his rectal condition.

Operative Treatment.—*Stretching the Sphincter* is suitable only in slight cases, and it is doubtful if it is worth doing at any time.

Injections of Carbolic Acid into the Piles.—This treatment, while in no sense a substitute for operation, is a most useful method in suitable cases. In the majority of cases so treated the piles recur in a year or two, but the treatment can easily be repeated. It has the advantage that no anæsthetic is required, and the patient is not obliged to lie up or to stop work. It is particularly useful in cases of bleeding piles where the piles themselves are not large, also in old people or patients suffering from some other condition which negatives an operation. It is advisable to state that it is not a treatment that is easy to manage unless one has had considerable practice. In the hands of experts it is practically painless and free from risk, but this is by no means the case with those who are inexperienced. The procedure consists in injecting each pile with a 15 per cent solution of carbolic acid in glycerin and water. From 4 to 8 min. of the solution is injected with a special syringe into the centre of each pile, not more than one or two piles being treated at a time. The piles swell up and then undergo fibrous change, being, in a successful case, converted into scars. Some kind of speculum is necessary to enable the surgeon to get at the pile. The solution must as far as possible be distributed through the pile by moving the point of the needle. Care must be taken not to inject the solution just under the mucous membrane, or to inject too much, or the pile may slough. A full description of the method will be found in the author's book on *Diseases of the Rectum*.

The Ligature Operation still remains by far the best all-round operation for piles (*Fig.* 33), and should be the only one performed, except by experts. The preparation of the patient is a most essential part of the operation, and should occupy two days. He should first be given a full dose of castor oil, and next day a dose of salts. After the bowels have been well opened, the diet should be restricted to food which will leave little or no residue. On the night prior to operation a soap-and-water enema should be given, and at the same time a dose of catechu mixture containing 7 min. of tincture of opium, or a 10-gr. Dover's powder. The next morning nothing except a cup of tea must be given, and an enema of plain water should be administered four hours before the operation. About an hour before operation a hypodermic injection of morphia gr. ¼ and atropine gr. $\frac{1}{100}$ should be given. The parts should not be shaved, but should be thoroughly

cleaned up in the usual way with antiseptics, preferably lysol, 2 drachms to the pint. On no account should the bowel be washed out with strong antiseptics. The anæsthetic should be ether. Chloroform has special dangers in rectal operations.

The Operation.—When the patient is fully anæsthetized, the lower part of the rectum should be washed out with soap and water, applied with small flat square swabs on the end of the first finger. Ether soap and lysol, 2 drachms to the pint, are best for this purpose. The rectal mucosa should be cleansed in this way in the same manner as the skin would be for an ordinary hernia operation. There is no necessity to stretch the sphincter at all, and it is much better not to do so, as it only causes pain afterwards. After the washing up, the lower rectum should be douched out with lysol, 1 drachm to the pint. Great care should be taken to make this cleansing of the rectum as thorough as possible. Pain after the operation is usually due to infection of the wounds, and consequent inflammation. It can be prevented entirely by careful attention to obtaining surgical cleanliness of the parts. Each pile which it is proposed to remove should be seized with forceps at its tip so that it can be pulled down. Taking the lowest pile first, a cut with a pair of scissors should be made so as to separate the pile from its attachment below to the rectal wall (*Fig.* 33), the object being to cut into the submucous layer. Into the cut thus made a stout plaited silk ligature is inserted, and, the pile being dragged down by an assistant, the ligature is firmly tied round the pedicle that is left after separating the pile. Each pile is treated in a similar manner. The piles should not be cut off—though if very large a portion can be removed. The ligatures are cut long enough to protrude from the anus,

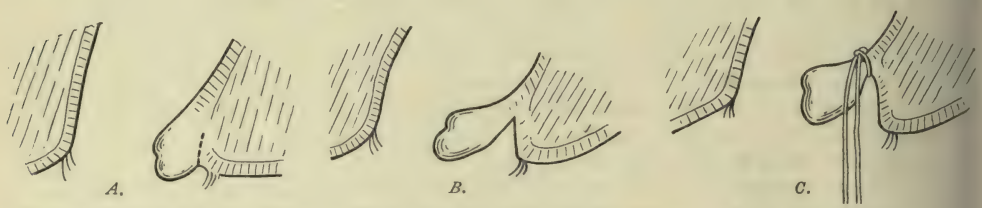


Diagram of rectum with pile. The dotted line shows the direction of the cut.

Shows the cut made and the pedicle formed ready for the application of the ligature.

The ligature in place.

Fig. 33.—To illustrate the Ligature Operation for Internal Piles.

and the wounds dressed by smearing them over with sterilized vaseline. Dressings and a bandage are then applied; the author squeezes the contents of a tube of sterilized vaseline into the rectum. If there is much venous oozing, a short piece of rubber tube, with a loop of silk through the end to prevent its being lost, should be inserted into the anus and left for twenty-four hours.

After-treatment.—No opium should be given after the operation unless there be pain, when a hypodermic injection of morphia is indicated. The dressing should be removed twice a day and the external parts douched with 1–40 carbolic. On the third or fourth day an ounce of castor oil should be given the first thing in the morning, and the bowels well opened. After the bowels have acted, the external parts must be well douched and then dressed with boracic powder or sterilized ointment. The bowels should then be kept acting easily each day with liquorice powder or salts.

If there be any external swelling, the patient should sit in a warm bath for twenty minutes once or twice daily. He must remain in bed till all the ligatures have separated and come away, which will be in from eight to twelve days; and for a week after this he should not walk about.

The success of the operation and the comfort of the patient depend very largely on performing the operation as antiseptically as possible and preventing the wounds from being infected during the first forty-eight hours.

On no account must a ligature be placed round any external pile or portion of skin, as extreme pain will result. Skin tags or external piles should simply be cut off and not ligatured.

Excision is performed by cutting off the pile flush with the mucous membrane, and sewing up the resulting wound with catgut. There are several methods of suturing the

wound, but the most important factor in obtaining success by this method is to thoroughly cleanse the rectum, and obtain aseptic healing in the wounds. There should be no pain after this operation.

While there are numerous methods described of excising piles, with immediate suture of the wounds, none of these operations give as good results as the ligature operation, failure and recurrence of the piles being not uncommon events.

Clamp and Cautery.—This consists in clamping each pile in turn, cutting off the pile in front of the clamp, and cauterizing the stump. The cauterization should be done with a Paquelin cautery-blade of fair size and at a dull red heat. Thorough burning of the stump is necessary, and the clamp should not be removed for a full minute after the burning is complete, or hæmorrhage is liable to occur. This method is best suited to cases where not more than three piles are present. It is inferior to the ligature operation, but gives good results if properly performed.

Whitehead's operation, which consists in excising the last inch-and-a-half of the rectal mucous membrane, has nothing to recommend it; and in view of the serious results which may follow, it should not be performed for uncomplicated piles.

J. P. Lockhart-Mummery.

HAIR, DISEASES OF.[1]

Baldness.—Alopecia areata is discussed elsewhere (p. 22). The treatment of premature fall of the hair demands consideration of the general condition of the patient and of the state of the scalp. No internal treatment has a specific action on the growth of the hair; but in many cases general tonics, such as arsenic, strychnine, and iron, are found to be of benefit.

Loss of hair frequently occurs during, and as a sequel of, acute illnesses, and especially of the exanthemata. It has been exceedingly frequent as a late sequel of influenza and pneumonia in the epidemics of the past two years. In the later months of pregnancy and after parturition it is not uncommon. In all of these conditions seborrhœa is often present. The administration of general tonics, change of air during convalescence, and the local application of stimulating lotions containing cantharides, with resorcin and salicylic acid to combat the seborrhœa, are usually efficient. The prognosis is generally good. Syphilis is an important cause of the fall of hair, and in the secondary stage it is one of the commonest phenomena of the disease, and yields to the treatment directed to the destruction of the spirochætes. Seborrhœa occurs frequently as a sequel of syphilis, and demands the local treatment indicated in that condition. The loss of hair in myxœdema is symptomatic, and yields to thyroid treatment.

Cicatricial alopecia, the result of burns, suppuration, lupus vulgaris, lupus erythematosus, syphilitic ulceration, etc., is permanent where the hair follicles are destroyed.

The commonest cause of the early loss of hair, both in men and women, is seborrhœa. Prevention is easier than cure, and attention to early seborrhœa capitis will prevent many cases of premature baldness. Even when the hair has begun to fall, measures directed to the cure of the seborrhœic process may be efficacious (*see* SEBORRHŒA). The most satisfactory applications in these conditions contain resorcin and monoacetate of resorcin, salicylic acid, sulphur, and tars. In some cases mercurial salts are also of service. Where the scalp is dry the addition of a little oleum ricini is advisable; if there is excess of oil, some solvent of fats such as acetone is of service. Useful formulæ are the following:—

℞	Hydrargyri Perchloridi	gr. j–ij	Olei Ricini	℥ss–j
	Resorcini Monacetyl.	℥j	Spiritum Vini Rectificati	ad ℥iv
	Acidi Formici	♏xx		

℞	Resorcini	℥j	Olei Ricini	℥ss
	Quininæ Sulphatis	gr. xv	Spiritum Vini Rectificati	ad ℥iv

Resorcin should not be used when the hair is very fair or white, as it tends to darken the tint; salicylic acid may then be substituted. If the fall of hair is associated with oily seborrhœa, the castor oil is omitted and acetone introduced thus:—

℞	Resorcini	℥iss	Acetoni	℥j
	Hydrargyri Perchloridi	gr. iss	Spiritum Vini Rectificati	ad ℥vj

The more stimulating preparations containing cantharides and essential oils should be

reserved for cases in which there is no tendency to seborrhœic dermatitis. The following formula is useful :—

℞	Tincturæ Cantharidis	℥ij	Spiritus Rosmarini	℥j
	Acidi Acetici Fortis	℥j	Aquam Rosæ	ad ℥viij
	Glycerini	℥iv		

Pilocarpine has many supporters, and the following formulæ are recommended by Brocq :—

℞	Tincturæ Jaborandi		Linimenti Saponis	℥iv
	Tincturæ Cantharidis	āā ℥j		

To be well shaken and applied once a day.

℞	Pilocarpinæ Hydrochloridi	gr. viij	Tincturæ Cantharidis	
	Olei Santalis		Spiritus Sacchari	
	Olei Gaultheriæ	āā ♏x	Spiritus Camphoræ	āā ℥iv
	Glycerini		Spiritum Vini Rectificati	ad ℥v

Ointments are often more useful than lotions, especially in the seborrhœic cases, and useful formulæ are the following :—

℞	Acidi Salicylici	gr. x	Sulphuris Præcipitati	℥j
	Beta-naphtholis	gr. xx	Vaselinum	ad ℥j
℞	Hydrargyri Bisulphidi	gr. v	Paraffinum Molle	ad ℥j
	Sulphuris Præcipitati	gr. xx		

Tars are also of service, and anthrasol colourless tar, in the proportion of a drachm to an ounce of vaseline and lanolin, may be tried. Shampooing of the scalp at regular intervals is necessary, and in cases where greasy preparations are used it may be required once a week. Nothing is better than Hebra's solution of soft soap and spirit, with the addition of a mild antiseptic such as thymol :—

℞	Thymolis	gr. xl	Saponis Viridis	℥ij
	Spiritus Vini Rectificati	℥ij		

Massage of the scalp, and high-frequency applications or the faradic brush, may also be of value in improving the nutrition of the scalp by developing temporary hyperæmia.

Canities.—Very little can be done for this condition. No local treatment has any effect upon the pigmentation of the hair. Where there has been some debilitating illness or nervous condition, the internal administration of tonics, such as arsenic and nux vomica, may be tried.

Hirsuties.—The removal of superfluous hair is best effected by electrolysis. For details of treatment *vide* ELECTROTHERAPEUTICS. In some extreme cases I have used repeated applications of the *x* rays, with a screen of aluminium 0·2 mm. in thickness. The sittings are given at intervals of six weeks at first, and later, intervals of three months or longer may be required. The possibility of cutaneous atrophy following this treatment must be explained to the patient, and I advise having a written indemnity.

James H. Sequeira.

HALLUX RIGIDUS.—This is an affection of adolescents, and only rarely of children. It consists of a progressive stiffening and flexion at the metatarsophalangeal joint of the big toe. The flexion may extend to 45° or 50°, and while it is sometimes accompanied by extension of the second phalanx, it is usually rigid in the straight position. Pain is at first complained of after walking or whenever forcible extension is made at the toe. The patient consequently walks with a stiff foot, and no effort is made to extend the metatarsophalangeal range. Anteroposterior pressure of the joint is usually painless, while lateral pressure is very painful. In the later stages, the joint is considerably swollen, but the bone itself rarely participates. A yielding of both the longitudinal and transverse arches is generally present. Pathological investigation reveals in many cases lipping of the head of the first metatarsal and hyperæmia of the joint.

TREATMENT.—In the early stages this should consist of rest and hyperextension of the toe. Either with or without an anæsthetic, the joint should be fixed in such a position that walking no longer strains it, and a bar should be placed across the boot posteriorly

to the metatarsophalangeal range. This bar will allow the patient to walk without straining his joint, and combines rest of the tender area with locomotion.

In certain cases accompanied by painful flat-foot the heel of the boot should be elongated and raised on the inner side. The bar across the sole should also be raised on the same side. This deviates the body weight from the inner to the outer side of the tarsus and relieves the painful area.

In a large proportion of cases, operation is the only effective procedure. The head of the metatarsal should be freely removed, along with $\frac{1}{4}$ to $\frac{1}{2}$ inch of the neck. On no account should the joint be resected, as ankylosis may result. The operation is generally most successful. *Robert Jones.*

HALLUX VALGUS and BUNION.—Hallux valgus is a deformity in which the first metatarsal bone turns in and the great toe turns out. It is a partial dislocation of the phalanx upon the metatarsal. In consequence, the sharp adducted inner condyle presses upon the skin, and gives rise to the prominent joint. A bursa in consequence forms beneath the skin, often accompanied by a hard corn, and this, in common with the irritated skin, is designated a bunion. This bursa is frequently the seat of inflammation, and therefore in time becomes much thickened. In exceptional circumstances the inflammation may advance to suppuration, accompanied by cellulitis, and an extremely serious condition may ensue.

The deflexion of the great toe frequently affects the other toes harmfully, and gives rise to the hammer-toe which so often is associated with the second toe.

The head of the metatarsal is thickened by the repeated attacks of inflammation and the pressure of the boot. The cartilage is thinned. The sesamoids and tendons are displaced outwards. Exostoses often form about the condyles, and lipping occurs as in hallux rigidus.

Practically the boot is always to blame for the occurrence of this disease. It often begins in boyhood, and gives rise to no pain until later in life. Injury and diathesis, such as rheumatoid arthritis, may add to the severity of the affection.

Treatment.—In the early stages simple treatment will suffice. In this and in all stages suitable boots must be worn. The inner border should be straight, and the toe-piece squared. The inner border of the uppers of the boot should be sufficiently capacious to prevent pressure upon the toe-joint. Manual rectification of the deformity, and digitated socks, are useful. At night a splint, reaching from the base of the metatarsal to the tip of the toe, with a large hole in the centre for the swollen bursa, and placed on the inner side of the foot, is often effective. Spring splints which can be worn in the boot are also used, but they are rarely comfortable. In more severe cases, where there are inflammation of the bunion and pain, a bar of leather or iron may be applied so as to traverse the sole of the boot, placed posteriorly to the metatarsophalangeal range. This proves a great comfort, and allows the patient to walk without pain. Flattening of the longitudinal and transverse arches of the foot is a common accompaniment of hallux valgus.

Operative Treatment.—Sometimes the removal of the sharp projecting bone, with division of the external lateral ligament of the joint, will suffice. The operation which we recommend, however, as being in every way satisfactory, is excision of the metatarsal head. In this, care must be taken to remove enough bone to subsequently ensure good movement, or to cover the end of the bone with soft structure to ensure a movable joint. There is no occasion to exsect the sesamoids, which form an excellent protective pad for walking. Excision of the articulation, i.e., the head of the metatarsal and the base of the phalanx, is to be avoided, as the result is a stiff joint which interferes with walking. No operation should be performed while the bunion is inflamed. Rest and fomentations will usually cure the inflammation quickly. But if suppurative cellulitis has supervened, prompt incision should be made, and operation upon the bone postponed. *Robert Jones.*

(*Revised by H. A. T. Fairbank.*)

HAMMER-TOE.—This condition is usually associated with hallux valgus, and secondary to it, and consists of the contraction of one or more toes, usually the second. The second phalanx is flexed and the third extended. It is generally due to the crowding of toes by lateral pressure caused by ill-fitting shoes. In the early stages no complaint

is made of the condition; but later, with the formation of callosities and sometimes ulceration, a very painful ailment exists, and locomotion is all but impossible. The condition is common both to childhood and to adolescence.

Treatment.—In the early stages this should consist in rectifying the hallux valgus and forcibly straightening the crooked toe. The surgeon should not be content until the toe be fixed in a splint in a hyperextended position, and so kept for fully a month. The toes should all be hyperextended on a metal splint applied to the soles, and flexed to an angle of 45° opposite the metatarsophalangeal range. On to this splint the toes should be firmly bandaged. For many weeks the splint should be worn at night, and the patient shown how to hyperextend his toes manually.

In slightly more severe cases, tenotomy of the under portion of the capsule and division of the tendon may be necessary.

In pronounced hammer-toe, with shortening of all the structures on the plantar aspect, exsection of the joint may be needed, and it is a very successful operation. A circular incision is made round the callosity, the skin is exsected, and the joint opened. A V-shaped excision of bone is made, which should include the joint. The skin wound is then stitched. The toe will then be straight and stiff, and will give no further trouble.

Amputation of the toe is never necessary, and no treatment should be undertaken unless the hallux valgus be treated also. Well-fitting shoes should be prescribed, allowing room for the free play of the toes. *Robert Jones.*

HARE-LIP.—Hare-lip may be represented by every degree of deformity, from a slight notch on the red margin of the lip, to a complete cleft which extends as a fissure throughout the whole substance of the lip and involves the floor of the nostril. The cleft may be present on one or both sides of the prolabium, so that a single or double hare-lip is the result. In the extreme forms of double hare-lip, the premaxilla may have no attachment to the alveolar margin of the jaw, but remain elevated in front of the surface of the rest of the lip by its attachment to the anterior part of the nasal septum. With all varieties of hare-lip, one of the many forms of cleft palate may be associated. This association is only of importance from the point of view of treatment when the cleft in the palate is a complete one; that is, when the alveolar margin of the jaw is incomplete. The early closure of the defect in the lip appears to exert a beneficial strain upon the separated margins of the palate, and, by approximating them, renders the gap in the palate narrower, and so more amenable to operative treatment later on.

The only treatment of hare-lip is by operation. The main points for consideration are: (1) *The time when the operation should be performed;* (2) *The type of operation best suited for each variety of deformity;* and (3) *The after-treatment of the patient.*

1. **Time for Operation.**—An operation for closure of hare-lip is a comparatively mild procedure, and is well borne by infants only a few weeks old. Since it is a general surgical experience that the earlier in life a congenital deformity is treated, the better is the cosmetic result achieved in later years, advantage should be taken of the fact that very young infants can tolerate an operation on a hare-lip well, and it should be performed as soon as possible. Six weeks of age may be regarded generally as a favourable date, provided that the baby is a healthy one. Chronic nasopharyngeal catarrh and disorders of digestion are common minor ailments that must be rectified before operation is undertaken. The presence of a cleft palate does not require any modification of this rule, since access to the palate for a subsequent operation is not impeded by the previous closure of the lip. If the cleft of the palate is an incomplete one, the closure of the lip has no effect upon it, even though nearly all the hard palate may be involved in the deformity.

2. **Type of Operation.**—The aim of all operations upon hare-lip is to produce a lip with the closest resemblance to normal that is possible. Certain general details must therefore be rigidly attended to in all operations. Variations in the operations to carry out these details will be determined by the type of the deformity. The edges of the cleft must be pared so that the whole of the red margin lining the sides is cut away (*Figs.* 34, 35). If not done freely, a small island of red tissue is likely to remain incorporated in the white area of the restored lip, where it produces a very obvious disfigurement. These

incisions must extend well up to the sides of the nostril if the hare-lip is a complete one. At the same time the attachment of the under aspect of the lip to the upper jaw must be cut away, and the tissues of the cheek freely undermined. These measures enable the two parts of the lip to be brought together without tension, and the two edges of the flattened nostril to be approximated so that its natural contour is restored. The first stitch should be inserted at the junction of the red and white portions of the lip on either side, and then tied so as to form a guide suture. The rest of the stitches can then be inserted on both aspects of the lip. Lane's finest curved cleft-palate needles, threaded with ophthalmic D silkworm gut, are well adapted for the purpose, since the stitch-holes made by these subsequently become almost invisible. A wide mattress suture of the same material, embracing the tissues of the lip on either side of the junction, forms a useful accessory support.

The premaxilla will require special treatment when a complete cleft of the hard palate is associated with a hare-lip. If the cleft is unilateral, then the premaxilla must be gently broken at its attachment to the alveolar margin of the jaw, and moulded by pressure towards the opposite side until it fills up the gap. The opposed margins of the cleft are made raw by the removal of the superficial tissue, and a stout silkworm-gut stitch passed through the mucoperiosteum of the maxilla and of the premaxilla serves to hold these surfaces in contact.

If the complete cleft of the palate is a double one, so that the premaxilla is situated mesially and elevated in front of and above the cleft by its attachment to the nasal septum,

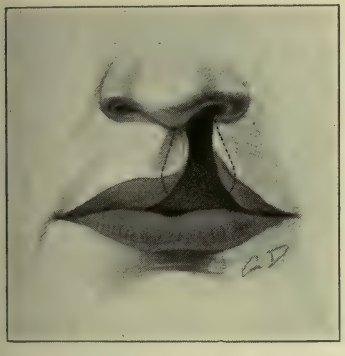


Fig. 34.—Complete single hare-lip. The area to be removed is enclosed with dotted lines.



Fig. 35.—Incomplete double hare-lip. The dotted lines indicate the area to be pared.

the removal of a small wedge-shaped area of bone from its under aspect allows it to be pressed down gently into the gap and fixed there by means of stout stitches as described above. The soft tissue of the lip must then be freely detached on its under aspect from the premaxilla, and the edges pared (*Fig.* 35) in a similar manner to those of an incomplete double hare-lip.

3. **After-treatment.**—A dressing should not be applied to the site of operation. It merely acts as a septic compress, and is likely to hinder the process of healing. The wound should be painted over with a solution of benzoin in ether, which can be renewed daily. This acts as an impermeable varnish, and is non-irritating to a baby's skin. Collodion is an irritant, and should not be used. The child can be breast-fed directly after operation whenever practicable. Crying can usually be prevented by skilful nursing. If this cannot be obtained, then mild opiates must be used, such as half-minim doses of tincture of opium, or small doses of bromide of potassium (gr. 5). There must be no hesitation in using these drugs, since crying is likely to put a strain upon the wound, with disastrous consequences. If the child shows any tendency to pick the wound, cardboard cuffs lined with wool must be applied to the elbow-joints to prevent the hands reaching the face. These are not resented by children, and are of extreme value in cases where the most skilled nursing cannot be obtained. The toilet of the nose must be attended to carefully.

George E. Waugh.

HAY FEVER (Vasomotor Rhinitis, Paroxysmal Rhinorrhœa).—For the purposes of treatment, hay fever, rose fever, paroxysmal rhinorrhœa, and vasomotor rhinitis may be regarded as varieties of the same affection.

PROPHYLAXIS.—In genuine hay fever, when the patient suffers only during the hay season, and can afford the necessary time and money, the most satisfactory treatment is to remove him from the noxious influences. If such a patient can spend the grass-flowering season on the sea, he will escape his annual attack, and no other treatment will be required. Even residence at the seaside or in a place with very little vegetation is often sufficient. In a similar way, if a patient suffers only when he is brought into contact with roses, peaches, cats, horses, or whatever the particular exciting cause may be, if the cause can be determined and the patient can be conveniently removed from its influence, no further treatment is necessary. When genuine hay fever is suspected, prophylactic treatment should also be carried out with pollaccine, an extract obtained from the pollen of grasses. It is necessary to make a *specific* diagnosis by means of a test outfit of pollaccine, because it is useless unless the grass pollen is the actual cause of the symptoms. Different dilutions of pollen toxin are supplied in sealed capillary tubes with full directions for their use. The contents of a tube dropped on to the eyeball of a normal man produces no effect, but when applied to a sufferer from hay fever the conjunctiva becomes slightly inflamed, the caruncle slightly reddened, and the patient experiences some irritation. This not only determines the diagnosis but also is used as a guide to the dose, the best prophylactic dose being one-third of the number of units strength which produces the faintest trace of ophthalmic reaction. These doses should be given by hypodermic injection every ten days or a fortnight, commencing in the early winter. A prolonged course of inoculations will stop or profoundly modify the attacks of hay fever in a large percentage of cases. If treatment is not commenced in the winter, but the patient is seen for the first time when the hay fever has actually commenced, pollaccine must be given in much smaller doses. It is advisable to commence with very small doses at short intervals of three to four days, gradually increasing the dose until it is found that the pollaccine is giving definite relief. Then treatment should be continued until the season is over. If the inoculations tend to increase the hay fever, it should be taken as a sign that the doses are too large. Full directions are supplied with each hay-fever reaction outfit.

GENERAL TREATMENT.—In that form of hay fever known as *paroxysmal rhinorrhœa* general treatment is most important. The majority of patients who suffer from these affections without any definite local exciting cause are 'highly strung' or definitely neurotic individuals with a family history of similar neuroses. Others suffer only when the general health is below par, when they are overworked, run down, or depressed as the result of worry or of severe illness; and in many of these, general treatment alone will effect a cure. In the first place, any general disease or derangement of the health must be rectified. If suffering from general debility, the patient should be advised to rest, or to take a long holiday; he should be given a plentiful but light and nutritious diet, and especially if thin, he may be recommended to take two or three pints of milk daily in addition to his ordinary food. In neurasthenic cases a modified form of Weir-Mitchell treatment may be necessary. In addition, certain drugs are often beneficial. Iron and strychnine always do good, and some patients derive decided benefit from a course of arsenic. (*See* NEURASTHENIA.)

NASAL TREATMENT.—When general treatment fails or is not especially indicated nasal treatment should be carried out. This applies to all forms of hay fever as well as to the many varieties of vasomotor rhinitis, although the latter is more tractable and yields better results. In the first place, any gross abnormality in the nose should be corrected. Spurs or deviations of the septum, polypus, hypertrophies of the inferior turbinates, adenoids, or other nasal disease should be appropriately dealt with. If no gross abnormality be found, the patient may be treated as for chronic rhinitis (*see* RHINITIS); a simple alkaline lotion should be prescribed, together with a soothing ointment, such as plain lanolin, or weak boric-acid and menthol ointment. Various similar drugs, such as thymol, camphor, chloretone, may be prescribed with the menthol and boric-acid ointment, or dissolved in oil and used as a spray. The efficacy of these prescriptions is greatly increased by the addition of cocaine (3 or 4 gr. to the ounce), which prescribed in this way and strength is quite harmless.

If no gross abnormality be found, and simple measures have failed, the best treatment is the application of the galvano-cautery. This is a purely empirical treatment, but properly applied can do no harm, nearly always does good, and frequently effects a cure. In the first instance, I should recommend that the anterior ends of the inferior turbinates should be superficially cauterized, two, or at most three, parallel lines being drawn horizontally along each turbinate. After one or two weeks the posterior ends of the turbinates should be similarly dealt with, and later the anterior ends again treated. If this fail, the cautery may be applied to the tubercle of the septum, that is, to an area on the septum opposite to the anterior end of the middle turbinate. This may be repeated on two or three occasions, and the cautery may also be applied high up and far back on the septum.

In severe vasomotor rhinitis, when the cautery fails, further surgical measures may be adopted, provided the patient's general condition is good. The best plan is to remove portions of the turbinates. The nose is packed with a solution of cocaine and suprarenal extract, and after twenty to thirty minutes a general anæsthetic is administered. In this way a good view of the interior of the nose is obtained and the operation is nearly bloodless. With cutting forceps, such as Mahu's or Grünwald's, a strip should be removed from the entire length of the inferior turbinates, enough being cut away to ensure a free passage through the nose even when the portion left is swollen. The middle turbinates, if œdematous or pressing against the septum, should also be dealt with, the anterior end or the whole of the turbinate being removed, as appears necessary. The greatly increased air-way through the nose resulting from this operation will effectually prevent the patient from suffering again from nasal obstruction, and the removal of much glandular and secreting tissue prevents the profuse watery discharge. In the most severe cases, where the nasal mucous membrane swells so much that the patient is unable to blow his nose, and suffers from severe headaches and constant dripping of watery discharge, the removal of the turbinates will relieve the worst symptoms, even when it fails to cure. Moreover, the removal of the turbinates in this affection never results later in the dryness of the throat and nose which may follow their removal in other conditions.

Palliative Measures.—During the actual paroxysms of hay fever immediate relief may be given by spraying the nose with cocaine. A 1 or 2 per cent solution may be used, and may be made more effective by the addition of adrenalin. These remedies, however, are extremely dangerous. The relief experienced is temporary, and is quickly followed by return of the symptoms in an aggravated form. More and more frequent recourse to the drug is required, until the patient may become its slave. This is especially apt to occur as the patients are almost invariably neurotic. Moreover, these remedies ultimately induce a relaxed condition of the nasal mucous membrane, and render the disease almost incurable by other treatment. Similar objections apply to the internal use of opium and belladonna, which also have been strongly recommended. *H. Lambert Lack.*

HEADACHE.—Headache may arise from many different causes. In treating it, therefore, we must endeavour to ascertain these causes and to obviate them. They will for the most part be found to group themselves under three heads: (1) *Organic disease of the parts actually involved in the ache*; (2) *Irritation in other areas*: '*peripheral irritation*'; (3) *Morbid states of the blood.*

1. **Organic Headache.**—This is generally taken to mean headache resulting from organic disease of some part involved in the pain, i.e., the brain, the meninges, the cranium, or overlying structures. When resulting from organic disease in other parts of the head, such as the eyes, ears, nose, throat, or mouth, the headache is not generally spoken of as organic.

Syphilis is the most common cause of organic headache, and may affect not only the brain and its coverings, but also the cranium and overlying scalp, in which case there may be great tenderness. It is to be noted that syphilitic headache may occur quite early after infection, even during the secondary rash; it is now known that the cerebral and spinal meninges may be affected as early as this. The pain is apt to be exaggerated at night, a feature which should always excite a suspicion of syphilis.

If there be the slightest suspicion that the headache is syphilitic, prompt and vigorous treatment must be adopted, for head pain frequently heralds a serious outbreak of cerebral

syphilis, such as the blocking of a cerebral artery. The intravenous administration of salvarsan is the most effective remedy. Short of this the patient should be mercurialized, and iodide of potassium given in not less than 1-drachm doses three or four times a day. This is no doubt a large dose, but even if iodism result, what is that compared with irretrievable damage of the brain?

Rheumatic or 'nodular' headache has in recent years attracted a good deal of attention on the Continent, where it is regarded as quite a common form of headache. It occurs most frequently in middle-aged and elderly women, and is liable to be brought on by a chill, as by sitting in a draught after washing the hair. The pain is persistent and may last for years. It is apt to increase at night and to be aggravated by the recumbent posture. Cold applications tend to increase, warm applications to relieve it. Careful palpation discloses within the subcutaneous tissues of the scalp and neck, in the substance of the cervical, occipital, and temporal muscles, or along the tendinous insertions into the occiput of the cervico-occipital muscles, circumscribed indurations highly tender to the touch. These consist of nodules varying in size from a millet seed to a bean. Along the tendinous insertions of the occipital muscles they usually form flattened masses. The nodules within the muscles are most easily felt when the latter are relaxed. The tenderness of the masses is due to the presence within them of sensory fibres (e.g., from the fifth, and the large and small occipital nerves), and the headache is sympathetically induced, just as it may be from other forms of peripheral irritation (e.g., disease of the teeth).

The treatment of this form of headache is general and local. As regards the former, the digestive system should be carefully attended to. The patient should abstain from alcohol. The hair should not be washed in water, but spirituous lotions used instead, and care should be taken to avoid chills. Among drugs, pot. iod., sod. salicyl., and pot. brom. are the best. Local treatment is *all-important*. It consists of massage of the head and neck, preceded by a two hours' application of hot poultices. Each manipulation lasts from fifteen to twenty-five minutes, and the entire course from one to three months. The first eight to ten manipulations generally cause considerable pain, and increase the headache, so that it may be necessary at this time to give anodynes, such as codeine and phenazone. Improvement begins from the third to the sixth week. The manipulations should be carried out every day until decided improvement occurs, when they should be limited to alternate days, and persevered in until all the indurations have been resolved. The necessary skill in manipulation can only be acquired after some practice. The patient assumes the sitting posture, resting his chin on both hands so as to steady the head. The operator begins by making downward strokes with the palms of the hands along the sides and back of the neck (effleurage); the underlying muscles are then vigorously kneaded, the deep ones being as far as possible plucked up from their supports (pétrissage). The indurations—subcutaneous, intramuscular, and intratendinous—are then individually kneaded, for about half a minute, by three or four finger tips, closely approximated, the movement adopted being a circular one from the shoulder-joint. Then follows a repetition of the effleurage. The same routine is gone through in the case of the scalp, and the sitting is terminated by a general effleurage of the entire head.

In headache from non-syphilitic tumour, opium still remains our sheet-anchor. In some cases of organic headache, as in abscess, tumour, or increased intracranial tension from whatever cause arising, relief may be afforded by trephining the skull (decompression). Sir Victor Horsley has by this means cured also traumatic headaches of many years' duration. When the root of the fifth nerve is involved, causing trigeminal neuralgia, the main branches of the nerve may be injected with a 70 per cent solution of alcohol (30 drops); or the Gasserian ganglion itself may be injected through the foramen ovale. Lumbar puncture is sometimes helpful.

2. **Headache from Peripheral Irritation.**—In all these cases, every possible source of the irritation must be sought for.

The scalp should be first examined. Among the poor, pediculi capitis are a frequent cause of distressing headache, and it should be remembered that in women the hair in the occipital region may conceal numerous pediculi and nits, even though on superficial examination the head may appear to be quite clean. The mere weight of the hair, by tugging on the scalp, may cause headache, as may also binding it up tightly, the wearing

of a heavy headdress, or a hard-rimmed hat which compresses the scalp. Fortunately, very light silk hats and 'bowlers' are now on the market for men, and are greatly to be preferred to the heavier kinds, being not only less productive of headache, but also less likely to cause baldness by strangulating the vessels of the scalp.

Irritation in the region of the eyes, such as may be caused by eyestrain, or by looking at bright lights, vivid colours, or rapidly-moving objects, is a frequent and potent cause of headache. The greatest care must be taken to obviate eyestrain if present, by correcting errors of refraction, fixation, and the like. Nor must it be forgotten that glaucoma, both in the acute and chronic form, is a possible cause of headache.

Disease in the nasal passages and accessory sinuses—frontal, maxillary, ethmoidal, and sphenoidal—as well as in the nasopharynx, is a potent source of headache, and may be present for a long time without being suspected: its diagnosis and treatment require the services of an expert. The use of the nasopharyngoscope has proved of great value in this connection. Adenoid disease is another not infrequent cause. Certain perfumes also, as those of the lily and hyacinth, may induce it. Again, affections of the pharynx and tonsils, e.g., acute pharyngitis and tonsillitis, cause headache, chiefly in the parietal and occipital regions.

The auditory apparatus may be the starting-point of the pain. Loud noise may induce it, as may also otitis media, the presence in the meatus of a mass of hardened cerumen, and indeed almost any affection of the ear. The pain may be a mere earache, or it may spread to the whole of the same side of the head, and even involve both sides.

Among the dental causes of headache must be reckoned difficulty of eruption, either of the temporary or the permanent teeth, overcrowding, caries, exostoses, buried fangs, peri-odontitis, unsuitable fillings, or imperfectly fitting plates. Let it not be forgotten that the tooth which is responsible for the headache may itself be perfectly painless. If any dental trouble exists, the services of the dentist will sooner or later be required, but in the meantime the medical man may afford temporary help. In difficult eruption, lancing the gums may relieve. In acute peri-odontitis, the overlying gum should be counter-irritated, and 2 gr. of sulphide of calcium, or 5 gr. pil. saponis co., or 3 to 5 gr. of calomel, may be given. In applying anodynes to a carious cavity, the latter should first be syringed with tepid water, and then thoroughly dried with pellets of cotton-wool. Some recommend the removal, with the help of a mouthglass and a few excavators, of the soft dentine, an operation which may be safely undertaken by the practitioner himself. After the anodyne has been applied, the cavity may be packed with wool partially moistened with mastic, care being taken not to press too firmly in the direction of the nerve.

One of the following applications may be used:—

℞ Acidi Carbolici (sat. sol.) Chloralis Hydratis (sat. sol.)		Tincturæ Camphoræ Co. Olei Menthæ Piperitæ	āā ℥j ℥ss
℞ Liquoris Opii Sedativi Olei Caryophylli	āā ℥ij	Camphoræ	℥iss

With regard to reflex headache from affections of the thoracic and abdominal viscera, Head has pointed out that these may not only cause reflected pain and tenderness in the correlated areas of the body wall, but also, if sufficiently intense, headache and scalp tenderness. Broadly speaking, the relation between the scalp and trunk areas is such that the higher the area in the trunk, the further forward is the correlated area in the scalp; thus the third and fourth cervical and upper thoracic areas are associated with areas over the nose and forehead; the seventh, eighth, and ninth thoracic with areas in the temporal, vertical, and parietal regions; and the tenth thoracic with the occipital region.

So far as disorders of the digestive viscera are concerned, headaches secondary to them are in the main due to secondary implication of the blood, and therefore come under *Class* 3.

The same is true of headaches associated with disturbance in the reproductive system. It is probably only exceptionally that such headaches are reflexly induced. Those associated with menstrual irregularities are certainly of hæmic origin.

3. **Headache due to Morbid States of the Blood.**—These are, of all causes, much the most common; indeed, functional headache seldom, if ever, occurs when the blood is healthy. Therefore, in such headaches always suspect the blood, even though marked peripheral irritation be present; and should it be unhealthy, seek to make it healthy and to raise the patient's health to the highest possible level. Measures to this end are eminently rational, in that they strike at the root of the evil; anodynes, though they may alleviate for the time, do but mask the trouble.

Among the blood conditions productive of headache are the following:—

Plethora, such as one meets in the overfed, and in stout amenorrhœic women at the climacteric. This condition should be treated by limiting the diet, by giving mercurials and salines, and in severe cases by bleeding. Attention may here be drawn to the fact that passive congestion of the head, and the consequent headache, are favoured by wearing stiff tight collars and tight corsets.

High Arterial Pressure, whether of the renal variety or not. In these cases the heightened pressure indicates some faulty blood state which it should be our business to correct. Otherwise the treatment is the same as for plethora. In severe cases rest in bed and complete or partial starvation are indicated.

Low Arterial Pressure. This may be a feature of intractable headache, and in some of these cases digitalis is of service.

Anæmia, in any of its many forms. Headache thus resulting is apt to be neuralgic.

Indigestion Toxæmia (by which I mean blood-poisoning from defective digestion in stomach, bowel, or liver), including as it does the toxæmia of gout, 'biliousness', and constipation, is of all causes of headache the most common. Obscure forms of intestinal and hepatic indigestion are especially apt to cause it, and it is probable that megrim, and not infrequently also the headaches associated with menstrual disturbances, arise in this way.

The importance of paying attention to the digestive system, in all sufferers from headache, cannot indeed be exaggerated. Their diet must be regulated with great care. Some patients require feeding up; others, especially those past middle life, may need to have their diet restricted. For most, the golden rule should be to eat simple food, in moderate quantity, and to chew it well, especially the farinaceous portion of it.

In some headaches, more especially megrim and its allies, benefit may be obtained by diminishing the quantity of animal food. A mere curtailment in the amount of butcher's meat may suffice; or it may be necessary to forbid it altogether; or, again, to prohibit bird, or even fish, limiting the diet to vegetable food, dairy produce, and eggs. Sometimes help may be got by putting the patient on a so-called 'purin-free diet'. The purins include uric acid, xanthin, hypoxanthin, theine, caffeine, and theobromine. They are to some extent formed within the body, but chiefly taken in with foods. Meat, meat extracts, liver, thymus, pancreas, and kidneys contain them in abundance; also many cereals, some fruits (e.g., strawberries), peas, beans, lentils, spinach, asparagus, onions, mushrooms, malt liquors, tea, coffee, and cocoa. The following are among the more important purin-free foods: nuts, chestnuts, dates, white bread, macaroni, potatoes, milk, cheese, butter, eggs, apples, grapes, raisins, figs, and honey.

It is a fact, however, that these headaches can also be benefited, and even cured, by an entirely opposite plan of treatment, i.e., by curtailing, or actually withholding, carbonaceous foods, as in the Salisbury treatment. Dr. Francis Hare claims to have obtained better results in megrim and the paroxysmal neuroses generally by treatment on these lines than on the opposite plan. Such has been my experience also. We must not, therefore, bind ourselves to any one system of diet in the treatment of headache, but consider each case on its own merits, and if we find that one plan does not answer, try another, our object being to secure normal digestion in stomach, bowel, and liver. If we succeed in this, it probably matters little what kind of food we give; for with normal digestion, the blood poured by the hepatic veins into the systemic stream will be healthy—uncontaminated by the products of defective digestion—and thus adapted to normal nutrition.

In treating periodic headaches and allied conditions by reducing the carbonaceous intake, Francis Hare usually begins "by placing the patient on a small, mainly proteid diet, consisting of, say, 8 to 12 oz. of cooked lean meat or fish, with 1½ oz. of bread or

toast and a little butter; green non-starchy vegetables are admissible, also tea and coffee, with a little milk but no sugar. The enforcement of such a daily diet, except in those who are extremely emaciated, is almost of necessity accompanied by a daily loss of weight. This loss is carefully estimated by weighing every day or on alternate days; this gives some index of the addition of the carbonaceous supply which is required. By carefully adding to the amount of carbohydrates and fats, preferably by very cautiously increasing the allowance of bread-foods, butter, and milk, we arrive shortly at a diet under which the body-weight remains stationary. Carbon equilibrium is then being maintained with the *minimum carbonaceous intake*".

It should be noted that headaches which have resisted every other form of treatment can often be cured by change of air and scene; and it is probable that in such cases the good is effected essentially through the digestive system; digestion is improved, and this leads to a better quality of blood and to improved nutrition generally. One may see a nervous, jaded, headachy woman, whom in her own home no kind of treatment benefits, return, after a few weeks' congenial holiday, full of the joy of life and without ache or pain of any kind.

The Toxæmia of Fever.—Febrile headache is apt to be accompanied by painful throbbing. Cold applications to the head relieve the pain.

Uræmia.—Headache, especially in the occipital region, is one of the classical signs of this condition. It may occur some time—in the case of granular kidney, many years—before the onset of the acute stage. Headache which appears for the first time, or gets worse, after middle life, should always arouse suspicion of granular kidney. Headache arising in this way may take the form of classical migraine. Calomel should be given by the mouth at night—short of touching the gums. It is a mistake to suppose that patients with granular kidney are intolerant of mercury.

Alcohol, Tobacco, and Drug Toxæmia.—The headache which follows upon a drunken debauch is well known. It is hardly necessary to observe that immature wines and spirits are much more likely to cause headache than the more mature varieties, nor to dwell upon the idiosyncrasies which are met with in respect of special alcoholic drinks—how, e.g., some cannot drink even a moderate quantity of good champagne without suffering from headache the next day, while others can tolerate champagne and not burgundy, and so forth. In general, it may be said that those prone to headache are best without any alcohol whatever.

Though smoking cannot be said to be a frequent cause of headache, it is a possible one.

In reference to drug headaches, it is important to remember that drugs, like iron and quinine, which have been wont to cause headache, can often be tolerated if they are given in small doses at first and then cautiously increased. Nor must it be forgotten that imagination may play a considerable part in the production of these headaches, and when this appears to be likely, it is well to keep the patient in the dark as to the drugs he is taking.

A few causes of headache not falling under any of the above headings still remain for consideration.

Mental Causes.—Intellectual effort may be a cause, as in the case of Newton, who is said always to have suffered pain in the head while working at the theory of lunar irregularities. This is, however, a much less frequent cause than emotional disturbance. School headaches result rather from eyestrain and from the emotional excitement attendant upon over-pressure, than from actual intellectual effort. Violent emotions, such as anger, may set up headache, and worry and suspense are yet more productive of it. Sufferers from headache should, as far as possible, live a serene and unemotional life.

Exertion.—Muscular exertion, especially if violent, or if pushed to the point of fatigue, or if necessitating stooping, as in gardening, may start a headache. Exercise within proper limits, however, may ward off headache.

Atmospheric Conditions.—Excessive heat and cold, and low barometric pressure, may all induce headache. Indeed, persons liable to headache are very susceptible to these and the other subtle influences which go to make up climate: thus, a person may be a martyr to headache in one place and entirely free from it in another, a fact to be borne in mind in recommending change of climate. As a rule, moderately bracing climates are the best, and inland resorts better than seaside.

Hot, stuffy rooms are highly provocative of headache. Those prone to this affection stand in pressing need of fresh air by day and by night.

Topical Treatment.—*Cold*, applied to the head by means of damp cloths or the ice-bag, is useful in headaches attended by throbbing, such as may occur in fever and migraine. In the latter affection it often happens that the head is flushed and throbbing while the rest of the body is unpleasantly cold. In these cases steps should be taken to make the body and the extremities warm, e.g., by warm wraps, and by putting the feet in hot mustard and water, or even by immersing the entire body in a hot bath, while cold is applied to the head.

When there is difficulty, as during delirium or sleep, in keeping the ice-bag constantly applied to the head, the patient may use as a pillow an indiarubber bottle or water-cushion filled with crushed ice and covered with the sheet.

In other cases, as in 'rheumatic' headache, the opposite plan of applying *Heat* to the head is beneficial, e.g., by means of a calico sand-bag heated to 120° and applied for half an hour three or four times a day. Good may also be got from the application of heat or cold to the neck.

The *Seton* is useful in obstinate forms of chronic headache, especially migraine. A portion of skin at the back of the neck is transfixed with a scalpel, and a probe passed through the wound; the knife having been withdrawn, a piece of ordinary household tape, about nine inches in length, is tied to the probe and pulled through the wound, and the ends are then loosely tied together. The patient is instructed to move the tape from side to side every day. The seton should be worn for three months at least, and if the pain recurs, a second, or even a third should be applied. Dr. F. Hare considers that the seton benefits by inducing a mild febrile state, thus promoting the oxidation of substances, the presence of which in excess may induce paroxysmal neuroses, headache among others. (*See* SETON, TREATMENT BY.)

Blistering may be of service, but it is apt to leave an unsightly scar. Croton-oil liniment, if well rubbed in, is equally efficacious, producing a copious crop of pustules which leave no scar.

Dry Cupping is sometimes helpful. Half a dozen cups should be applied just below the clavicles and between the scapulæ, and smaller ones in the region of the ears, a procedure which may be repeated frequently.

Among *Anodyne Applications*, the following may be employed:—(1) Liniment. opii; (2) Liniment. belladonnæ; (3) A drachm each of chloral, camphor, and chloroform, with half a drachm of morphia, to be brushed in for its anæsthetic effect; (4) Twenty drops each of oil of cloves and oil of cinnamon, with one drachm of menthol and an ounce of alcohol; (5) One ounce of tinct. belladonnæ and ten drops each of tinct. aconiti and tinct. chloroformi; (6) One part each of chloral and menthol, two parts of cocoanut butter, and four parts of spermaceti; (7) Half a grain of croton oil, with two ounces of petroleum ointment.

Electricity, either in the form of faradism, galvanism, the high-frequency current, or franklinism, may be useful. A mild high-frequency discharge from a vacuum electrode is employed over the painful portions of the scalp and the back of the neck, for a few minutes daily for several days. In severe and protracted cases galvanism should be employed as well for several weeks. The negative pole should be placed on the nape of the neck and the positive moved slowly over the forehead, with an occasional reversal of the current; if faradism is used, the current should be mild, and applied to the temples or the cervical sympathetic, or recourse may be had to the wire brush.

Massage of the head and neck is often of service, especially in rheumatic headache, as already pointed out.

Bleeding is indicated in the headache associated with plethora and high arterial tension, above all in that of acute uræmia. Its beneficial influence on headache is well shown in the case of spontaneous hæmorrhages, e.g., from the nose, rectum, or uterus.

Firm Pressure to the head, such as is afforded by a closely fitting capeline bandage, often relieves headache, especially headache attended by fits of throbbing. Sarason has constructed an apparatus (made by Schönlein & Co., Munich) which he calls a megrainator. It consists of two pads which can be pressed firmly against the temples by an adjustable spring. He has found it useful in many cases of megrim.

Compression of the Temporal Arteries is sometimes of service. For this purpose it has been recommended to employ a semicircular band of steel, provided at each end with a movable pad, so that the pressure need not always be applied to exactly the same spot.

Trephining, as already stated, may be called for in organic headache.

Lumbar puncture may be helpful in reducing intracranial tension.

Drug Treatment.—Of the various anodyne drugs employed in the treatment of headache, the best are phenazone, phenacetin, acetanilide, phenalgin, acetylsalicylic acid, citrate of caffeine, and opium ; but it should ever be remembered that such drugs do little more than relieve the pain for the time being, leaving the root of the evil untouched.

In syphilitic headache, iodide of potassium should, as before observed, be given in heroic doses, e.g., 1 drachm three or four times a day, either alone or combined with small doses of mercury.

In violent neuralgic headache, we may prescribe ½-drachm doses of ammonium chloride, combined with 7½ drops tinct. gelsemii and a drachm of syrup. aurantii, the mixture to be repeated hourly until three doses have been taken. Butyl chloral hydrate, in 5-gr. doses, is also useful in neuralgic headache and in the headache of anæmic girls. It readily dissolves in glycerin, or it may be suspended in mistura amygdalæ with a drachm of syrup.

The inhalation of 10 to 20 drops of chloroform, either from the hand or from a piece of lint in a wineglass, may be of service, as may also the simple and saline ethers, e.g., ½ to 1½ drachms of the simple or compound spirits of ether, or the same quantity of spiritus ætheris nitrosi. Oxygen inhalations are often of great service.

Nitrite of amyl and nitroglycerin may be tried when the arterial blood-pressure is unduly high. The latter drug, given for weeks together, is said to be useful in averting the attacks of migraine, for which also guarana is sometimes helpful, one to two drachms of the powder being given in hot water sweetened with sugar, or the fluid extract may be prescribed in drachm doses. Turpentine, in 10- to 20-drop doses, sometimes does good ; it should be mixed with mucilage, and flavoured with oil of cinnamon, in 1-drop doses.

Quinine, in 10-gr. doses, is indicated in malarial headache, or in any severe periodic headache, e.g., one coming on at the same time every day or night ; it should be given just before the expected attack.

In some of the slighter forms of headache, acid mixtures are useful, e.g., 10 drops of dilute nitrohydrochloric acid, 10 drops tincture of nux vomica, ½ drachm each of tinct. gentianæ co. and syrup. aurantii, made up to an ounce of water.

Lactate of calcium or chloride of calcium, in 5- to 15-gr. doses thrice daily, may be of service when the coagulability of the blood is subnormal. They may be prescribed as follows :—

℞ Calcii Lactatis gr xv | Aquæ Chloroformi ℥j
Tincturæ Capsici ♏ ½ |

(Or, 15 grs. of the lactate may be dissolved in a third of a tumbler of water.)

℞ Calcii Chloridi gr xv | Aquæ Camphoræ ℥j

This treatment should be continued for at least three weeks. (*See also* MIGRAINE.)

Harry Campbell.

HEAD-NODDING.—(*See* NYSTAGMUS.)

HEALTH RESORTS.—These are most conveniently divided into (1) Climatic stations, and (2) Spas. The first group includes those resorts which are esteemed chiefly on account of their possession of some special climatic virtue, such as high altitude, desert air, or sea air ; the second comprises stations which rest their therapeutic claims mainly upon the possession of natural mineral waters, used either internally for drinking, or externally for bathing.

1. **Climatic Stations** fall into classes according to their effects upon general metabolism, of which, in a general survey such as this article offers, it is possible to consider only the two extremes. A bracing climate is one which promotes metabolism and leads to the expenditure of vital force. A relaxing or sedative climate acts inversely ; it retards metabolism and husbands the vital powers. Expressed in terms of ordinary drug remedies,

the one might be compared to ammoniated quinine, the other to bromide of potassium. Differences in the effects produced by the two kinds of climate are due in the main to differences in the degrees of humidity in the atmosphere. Dry climates are bracing ; humid climates are sedative or relaxing. Dry climates are subject to sudden and considerable variations of temperature, and call forth, in consequence, very brisk reactions in those who are subjected thereto. The all too common prescription of " some good, bracing climate " for the debilitated convalescent is very much to be deprecated ; for such climates frequently make demands upon the physiological resources of invalids with which the latter are unable to comply. Humid climates are not open to this objection. Their characteristic is equability of temperature. The aqueous vapour in the air acts the part of a poultice, and prevents that rapid radiation of heat from the earth which in a dry atmosphere is inevitable. Such climates are disagreeable to most healthy people, who find themselves thereby rendered lethargic and somnolent ; but for invalids, the very old, and the delicate young, they are eminently suitable. It should be observed that the humidity of the air in a locality has no ascertainable relation to the rainfall. There are many places whose humidity is high which nevertheless have a low rainfall, and vice versa. Humidity is usually expressed in percentages of saturation. Saturation of the atmosphere with aqueous vapour being taken as 100, a high relative humidity would be anything approaching 90, a low relative humidity would be anything below 60. Low humidity characterizes the stations on the east coast of England, notably in the Isle of Thanet (Westgate and Margate), and this coast supplies in consequence our most bracing climates. The further south and west we travel, the greater becomes the humidity and the more sedative the climate ; until, on the southern coasts of Devonshire and Cornwall, we arrive at stations such as Sidmouth, Torquay, and Falmouth, which may be considered as typical examples of the sedative class.

The character of an inland station may be gauged to some extent by its situation and exposure. Low-lying, sheltered places tend to be relaxing ; those which are well elevated above sea-level, especially if they be fully exposed to the sun and the prevailing winds, are for the most part bracing. A moderate elevation may be taken as 1000 feet. Below this figure a station inclines to be sedative ; anything above this figure may be regarded as bracing, and when 2000 feet is reached we arrive at what is known as moorland or sub-mountainous climates, which are emphatically bracing. The most characteristic type of bracing climate is supplied by those stations which are called stations of altitude. These are chiefly to be found in Switzerland, and the best known among them are Davos (5000 ft.), Arosa (5500 ft.), St. Moritz (5800 ft.), and Leysin (4700 ft.).

A favourite centre for trying various degrees of altitude is Montreux, on the Lake of Geneva. Easily accessible from this centre are Les Planches (1400 ft.), Glion (2250 ft.), Caux (3600 ft.), Les Avants (3500 ft.), and Rochers-de-Naye (6470 ft.), all of which, except the last-named, are winter as well as summer resorts. They all have excellent accommodation.

Such climates as these places present are most unsuited to people who suffer from real organic disease as distinct from mere disturbance of function. This is pre-eminently true of renal disease, heart disease, emphysema, and of any condition where the aeration of the blood is difficult or deficient. All cases which show a high blood-pressure should be very especially cautioned against high altitudes. The proper utilization of such climates in tuberculosis is a very complex matter, into the details of which it is impossible to enter here. It may, however, be laid down as a general rule that only those cases which give hope of brisk and considerable recuperative power should be subjected to the trying conditions which high altitudes necessarily entail ; and it is well to remember that in this disease climatic considerations are as nothing compared with the minutest observance of open-air principles.

The choice of a climate for an individual case is never an easy matter. Invalids are exacting and weather is capricious, so that, however excellent our choice may be in theory, it not infrequently proves unsuccessful in practice. Such want of success is always disappointing, but we may save ourselves from the humiliating consideration of having done actual harm if we are careful to observe certain well-defined rules. They consist in an estimate of the patient's powers of response to metabolic stimuli, and the application of the above-mentioned general divisions of climates. It is a very common mistake for the

prescriber to select for his patient the type of climate which he has found most suited to his own case. As most prescribers prefer a bracing climate to a sedative, and as it is necessarily a few only who have any personal acquaintance with foreign stations, the aged and the organically unsound are not infrequently hurried to distant countries, to their undoing. It is necessary to repeat, then, that really bracing climates are suited only to those who have ample recuperative power, and should never be prescribed for such as demand that their vital powers should be husbanded. Especially does this apply to the subjects of cardiovascular disease, renal disease, and disease of the central nervous system. For such patients, and for those suffering from emphysema and other decrescent disabilities, the sedative climates of our west and south-west coasts are eminently suited. Abroad, Pau and Arcachon may be mentioned as sedative winter stations to which such patients may be recommended with confidence. Biarritz, though more bracing than either, may be regarded as well within the sedative category.

The climate of the Riviera is *sui generis*. Most of the stations, especially Mentone and San Remo, inasmuch as their humidity is relatively high, are of the sedative order, but they are nevertheless subject to very rapid and decided changes of daily temperature. It is warm and relaxing during the day, but at sundown it suddenly becomes cold and bracing. The amount of sunshine, and the excellent accommodation to be obtained at most of the stations from Cannes to San Remo, have made the coast justly popular with English people, but it is frequented as a playground rather than as a sanatorium.

The climate of Egypt is also *sui generis* in that it combines a very low relative humidity with a remarkable equability of temperature. Both these characteristics are becoming very much less marked since the vast scheme of irrigation from the Nile has been producing its effect upon the country. Cairo, from its insanitary state, is not at all suited to invalids, but Helouan, fifteen miles to the south, is an excellent health resort, with warm sulphur waters and a good bathing establishment. Algiers presents a climate midway between those of the western Riviera and of Egypt. The stations there, Hammam R'Hira, Hammam Meskoutine, and Biskra, are all agreeable places in which to winter. The cost of living is rather less than in Egypt.

2. **Spas.**—Health resorts which have natural mineral waters are commonly known as spas. Attempts have been made to classify such stations according to the chemical composition of their waters. It is, however, becoming increasingly evident that such therapeutic powers as these waters possess depend less upon their exact chemical ingredients than upon some physico-chemical activity such as radio-activity, the exact nature of which remains to be demonstrated. Moreover, certain spas have, so to speak, specialized in certain classes of complaints, and such specialization has in many cases evidently not been dictated by anything in the chemical composition of the waters. It is therefore not only less confusing, but, in the present state of our knowledge, much more rational, to classify spas not upon a chemical scale but upon their therapeutic indications. Before attempting such a classification, it must be premised that spas are not exempt from climatic influences, so that in choosing a spa the physician must not lose sight of the general principles of climatology which have already been indicated.

Spa treatment is suited only to the earlier stages of chronic disease; in no circumstances should acute cases, or those which are far advanced, be advised to undertake the fatigue of long journeys, the expense, the anxiety, the unfamiliarity with surroundings and perchance language, which such treatment of necessity entails. Some of these factors contribute very powerfully to the beneficial effects produced in suitable cases, the element of change being of the essence of the 'cure'; but in acute or advanced cases they are altogether harmful.

Spa treatment is thus pre-eminently the treatment of chronic disease. Most chronic disorders may be brought under three heads: gouty, syphilitic, and tuberculous. The last-named may for obvious reasons be dismissed; the second will be considered later; there remains therefore the question of gout, the commonest and most potent cause of chronic affections.

Gout.—Almost all spas undertake to treat gout, or rather the gouty state; for gout in its acute form offers no exception to what has just been stated. The gouty state may express itself clinically in many different ways. The gouty patient may complain of gastro-intestinal troubles, he may be the subject of respiratory disorders, his circulatory

system may be affected, he may be troubled in his joints, or suffer from cutaneous eruptions. One gouty person may be irritable, another melancholic; some are plethoric, others anæmic. In the case of a disease of such protean aspects, it is not surprising that a great variety of spas should undertake the management of its victims, and perform it with considerable success. For the fact is, the successful treatment of the gouty state depends upon general hygienic considerations—diet, exercise, and activity of all the emunctories—which can be imposed at one spa almost as readily as at another, so that the choice in an individual case, though it should depend upon the indication afforded by the most troublesome manifestation, may within certain limits be decided by questions of predilection and convenience.

It is impossible here to attempt anything like an exhaustive analysis of the stations which have specialized in particular branches of goutiness, but a few instances may be serviceable. In the chronic or subacute arthritic manifestations of the gouty state, Aix-les-Bains, in Savoy, takes the first place. It has a world-wide reputation, and the physicians are very experienced in all matters pertaining to disorders of the joints. In this country, Bath in winter, and Buxton and Harrogate in summer, may be recommended with confidence in the same and similar conditions. In gastro-intestinal disorders, Carlsbad, Marienbad, Vichy, and Brides-les-Bains are the best known. The first two are suited more especially to the strong and plethoric; the last two in the case of the weakly and debilitated. Certain other stations, such as Homburg, Kissingen, and Wiesbaden, have attained to a reputation in the gastro-intestinal disorders of the gouty. Inasmuch, however, as they all contain a considerable amount of common salt in their waters, they cannot be regarded as altogether free from objection. Chloride of sodium is very unsuitable to most gouty people.

Respiratory Disorders are much more frequently caused by an underlying gouty state than most people imagine. This is particularly true in the case of children of gouty parentage, in whom nasal, pharyngeal, and bronchial troubles are very liable to occur, and in whom the orthodox treatment is often very disappointing. Asthma, and chronic bronchitis with occasional acute ebullitions, in adults, should always raise a suspicion of the responsibility of goutiness for the attacks. The three principal stations which have specialized in these conditions are Mont Dore, Ems, and Cauterets. Mont Dore is situated in the centre of France (Puy-de-Dôme), at an elevation of 3,500 ft. The waters contain a small quantity of arsenic, which is erroneously supposed to confer upon them their special qualities. The 'cure' is conspicuously beneficial in cases of asthma—more especially bronchial asthma—and chronic bronchitis. Pure nervous asthma and other functional nervous disorders also derive benefit. Ems is a much more sedative station than Mont Dore. Its elevation is but 260 feet, but it is very beautifully situated among wooded slopes on both banks of a small river. The only objection to it is that it is apt to be unduly hot in July and August. Cauterets is situated at an elevation of 3200 feet in the Pyrenees, and is a very popular resort for all respiratory disorders, more especially for those which affect the larynx. It is invaded during the season by actors, orators, singers, and others who use their voices much.

Circulatory Disorders are not of course a special appanage of the gouty state, though they are so to a greater extent than is commonly supposed. The French have a saying that gout is to the arteries what rheumatism is to the heart; and a timely recollection of this association would often lead to a prevention of arterial disease. By ridding the system of the poisons whose gradual accumulation leads to such disease, spa treatment may effect a great deal; but the appeal which is made in such circumstances is a general one for increased metabolic and excretory activity rather than one which is directly addressed to the vascular system. There is, however, one exception to this generalization which deserves more than a passing notice. One of the most troublesome forms in which the gouty state is liable to show itself is an inflammatory disturbance of the veins, especially of the lower extremities, which is particularly rebellious to ordinary treatment and very liable to recurrence. There is a station called Bagnoles-de-l'Orme, in Normandy, which in such conditions is capable of producing effects which approach the miraculous. It is unfortunately very little known in this country, but its accessibility and its admirable equipment, no less than its agreeable climate, render it well worthy of the attention of English physicians.

With circulatory disorders which originate in the heart itself the reputation of Nauheim had at one time become so intimately associated, in the minds both of the profession and the public, that a dispassionate estimate of the claims of this spa could scarcely obtain a hearing. Unquestioning belief in the exaggerated statements of astute advertisements may last long enough to afford a commercial justification for such methods, but scientific truth is invariably vindicated in the long run, and most medical men now realize that there is nothing magical in the Nauheim waters, that the methods as practised at this spa are equally well administered elsewhere, that these methods, so far from affording a sovereign remedy in all cardiac cases, are in reality of very limited application, and, finally, that Nauheim itself is not only inaccessible from this country, but that its climate leaves a great deal to be desired. The places at home at which effervescing baths and resistant exercises can be obtained include London, Bath, Buxton, Harrogate, Sidmouth, and Llangammarch Wells. The last-named, by a scientific use of its barium waters, has attained results which are in many cases superior to those which may be expected of the Nauheim methods.

In France there are two stations which have specialized in cardiac disorders, namely, Royat and Bourbon-Lancy. Both these spas are in the Puy-de-Dôme district, not far from Mont Dore, both are pleasantly situated, and both are admirably equipped for the treatment of those cases which they seek to attract. Royat was originally, and to a large extent still remains, a spa at which the treatment of all the manifestations of the gouty state was undertaken, but the impetus which recent investigations have given to the study of cardiovascular disorders, together with its possession of carbo-gaseous waters, has caused it in recent years to specialize in the treatment of the cardiopathies of the gouty state. Hence it is that functional cardiac troubles and the numerous cases in which the central organ is bending under the burden of increased peripheral resistance, no less than those in which vascular tone is deficient, find at Royat a degree of amelioration which is scarcely to be found elsewhere. Bourbon-Lancy is to heart affections of rheumatic origin what Royat is to those of gouty origin. It is not that any pretence is there made that valvular lesions can be cured, but the two claims that are put forward are usually amply justified by results in well-selected cases. These claims are, first, that a course of treatment there tends to eradicate the rheumatic habit, and thus guards against a recurrence of endocarditis ; and secondly, that in recent cases, more especially in young people, the functional capacity of the heart is educated to overcome its mechanical disabilities. There are very few spas which fulfil their claims so satisfactorily as Bourbon-Lancy.

The *Cutaneous Affections* in which benefit may be expected from spa treatment are those in which the dermatosis is of general rather than local origin, and the treatment resolves itself consequently into that of the underlying cause. Many of the sulphur-water spas make a special point of the treatment of cutaneous affections, especially of such as are associated with the gouty state. In this country, Harrogate and Strathpeffer enjoy a well-deserved reputation ; in France, Luchon in the Pyrenees and Uriage in the Alps are very agreeable and much patronized stations. Mention ought also to be made of St. Christau, a spa which has the unusual merit of being open in winter as well as summer. Its waters contain a salt which is a very uncommon constituent in natural mineral waters, namely, sulphate of copper. St. Christau is in the Pyrenees, close to Pau. It is a very agreeable and well-regulated little spa, which deserves to be better known.

So far we have considered chiefly the gouty states which show themselves by some such obtrusive manifestation as arthritis, hepatic congestion, vascular disturbance, or what not. There are, however, cases of goutiness which present no such salient features. These occur in people who, though they may present a large number of the stigmata of the diathesis, have nevertheless no symptom which marks them as more suited to one spa than another. Such cases are best dealt with at stations which appeal more especially to the natural emunctories—the skin, the bowels, and the kidneys. The skin is stimulated at all spas which possess a bathing establishment. At such places not only the natural thermal waters, but electricity, massage, and other physical devices, are employed to increase the activity of this large and unduly neglected excretory organ. Reference has already been made to what may be called the 'purgative' spas, of which Marienbad is

the type. There remain to be considered those which make a special appeal to the renal output. The best known of these is Contrexéville in the Vosges mountains, a spa which has for generations enjoyed a world-wide reputation. It is one of a group of three, the other two being Vittel and Martigny, which are situated quite close to one another, and which, having substantially the same kind of water, may be prescribed indiscriminately. Of the three, Vittel is infinitely the most active and enterprising. It has a beautiful bathing establishment, and the accommodation is excellent; but, in comparison with the other two, it is expensive.

Superior in most respects to any of those in the Vosges group is Evian, on the Lake of Geneva. The bathing establishment at this comparatively new and very beautifully situated spa is one of the most completely equipped in Europe, while the waters of the 'Source Cachat' promote the activity of the kidneys in a manner which is truly remarkable. The kidneys being the normal path for the disposal of nitrogenous waste, treatment by 'renal' waters, especially when adequately reinforced by bathing, massage, Zander exercise, and due attention to the bowels, is the most satisfactory means of dealing with people who are gouty in an indefinite way. The renal spas are also very conspicuously useful in those who are the subjects of high arterial tension in its functional stage. The 'demineralization' of the tissues which such treatment brings about is much more lastingly beneficial than treatment by means of drugs.

Syphilis.—This disease is more successfully treated at spas than when the patient is among his ordinary surroundings, just as goutiness is more successfully so treated, namely, because the atmosphere of the spa conduces to that minute observance of detail which in such cases is essential. Mercury is used at the spas by inunction and subcutaneous injection, but chiefly by inunction, the baths and concomitant methods being merely accessory. There is theoretically nothing to be said in favour of spa treatment which may not be urged in favour of similar methods employed at home, but practical experience shows that the results of spa treatment are so immeasurably superior to any other, that it is not too much to say that by neglecting to advise such treatment the physician is not doing his best for the patient. The advantages are not confined to any stage of the disease, though it is naturally in the earliest that the best results are to be expected.

There are four spas which have specialized in this direction: Aix-la-Chapelle (or more properly, Aachen), Wiesbaden, Luchon, and Uriage. The first-named is so immeasurably superior to the others that the only excuse for mentioning them is to supply an alternative for those people (and they are many) who object to go to Aachen for fear that by so doing they may be advertising the nature of their complaint. The choice between Wiesbaden, Luchon, and Uriage must rest upon considerations of fancy and convenience.

Anæmia.—There are several stations at which anæmic conditions, especially chlorosis, are very successfully treated. The best known of these are St. Moritz, Schwalbach, and Spa in Belgium. All these places have iron waters charged with carbonic acid gas. They are all very attractive, well-managed stations, at which the physicians are exceptionally experienced. Spa has the advantage of easy accessibility from this country, while in favour of St. Moritz may be urged its great elevation, because, apart altogether from iron waters, high altitudes are very useful in chlorotic states.

Rectal and Pelvic Conditions.—It would not be satisfactory to conclude this brief survey without a word about rectal spas and spas which make a special point of the treatment of pelvic diseases in women. The first place to pay any special attention to disorders of the large intestine was Plombières, in the Vosges Mountains. The success which has attended this specialization has secured for Plombières a large number of imitators, none of which have as yet attained to the standard of excellence of their prototype.

The best-known 'ladies' spa' is Franzensbad, in Germany. There seems to be no particular reason why this station should have specialized in this direction, but the results which are obtained there are such as to justify the great reputation which it now enjoys. Another spa of scarcely less renown is St. Sauveur, in the Pyrenees.

It is well to point out in conclusion, that by no means the least important matter in the selection of a spa, for whatever purpose, is a wise choice of the physician to those care the patient is to be entrusted. *Leonard Williams.*

HEART-BLOCK.—(*See* BRADYCARDIA.)

HEART, DILATATION OF.—(*See* MYOCARDIAL FAILURE.)

HEART, FATTY.—(*See* MYOCARDIAL FAILURE.)

HEART, IRREGULARITY OF.

1. Arrhythmia due to Extrasystoles.—

An extrasystole is a contraction of the heart which occurs before the next beat is normally due, and it originates in some part of the heart other than the sino-auricular node, the normal site of origin.

Apart from the extrasystoles, the action of the heart is regular. The premature systole is less forcible than the normal systole, and may fail to send a perceptible pulse to the wrist, in which case the finger is only aware of a long pause between two normal pulse-waves—an intermission ; or the premature beat may be represented at the wrist by a small but palpable wave.

The incidence of extrasystoles varies greatly. The intermissions may occur infrequently, but sometimes they are so numerous as to simulate the disorderly rhythm of auricular fibrillation.

When every second beat of the heart is premature, we find a 'bigeminal' pulse ; when every third, the 'trigeminal' pulse. One meets with many individuals in whom the cardiac musculature is abnormally excitable ; they live a healthy, vigorous life, and on examining their heart no disease can be found. In these patients extrasystoles are common, and sometimes cause considerable mental distress. Extrasystoles are also met with in many neurasthenics, or they may result from cardiac strain, from disease of the myocardium, or from toxic influences such as alcohol, tea, coffee, and tobacco. They are frequently found in patients with high arterial tension, arteriosclerosis, or gout. Emotion, excitement, and exertion may precipitate their appearance. They are common in the aged. Gastro-intestinal disturbance and other reflex causes are often exciting factors. In themselves they are not significant ; the gravity of their occurrence is over-estimated ; and unless there is evidence of cardiac disability or structural disease, the patients should be reassured and impressed with the fact that these irregular heart-beats are disagreeable rather than dangerous.

TREATMENT.—There can be no uniform line of treatment. It must be based on the etiology and on the general condition of the patient. All possible reflex causes must be reviewed. The dietary should be carefully considered, and constipation avoided. Dry meals are useful, with sufficient fluid at times which will not interfere with the digestive processes (*see* FLATULENCE *and* MYOCARDIAL FAILURE).

If in spite of careful dieting the dyspeptic symptoms persist, then some simple stomachic should be ordered.

℞ Sodii Bicarbonatis gr. x | Aquam Menthæ Piperitæ ad ℥ss
Tincturæ Rhei Compositæ ♏xij |

One tablespoonful in water before meals.

Ten to fifteen grains of ammonium bromide may be added to this mixture with benefit in nervous patients.

In the case of toxic influences, endeavours must be made to eliminate them from the system, and as regards chemical substances like alcohol and tobacco, the patient must be advised to cease using them.

In the gouty, strict instructions as to diet are to be laid down, and once a week a blue pill or a dose of calomel should be taken. A morning saline is useful. A mixture such as the following is of value :—

℞ Potassii Citratis gr. xxx | Infusum Gentianæ Compositæ ad ℥ss
Tincturæ Colchici ♏xv |

A tablespoonful to be taken in water shortly before food thrice daily.

If for any reason colchicum is not well tolerated, cachets containing guaiacum resin, in doses of 5 to 10 gr., should be employed.

The irritable and excitable heart muscle of neurasthenia should be braced up by carefully regulated exercise and rest. If extrasystoles are very numerous, and do not respond to the above treatment, then digitalis, in 5-min. doses of the tincture, should be taken thrice daily. In these patients, a mixture containing nux vomica and bromide is also valuable.

℞ Tincturæ Nucis Vomicæ ♏x | Spiritus Chloroformi ♏x
Ammonii Bromidi gr. x | Infusum Gentianæ Compositæ ad ℥ss

A tablespoonful in water thrice daily before meals.

2. Arrhythmia due to Auricular Fibrillation.—

This must be carefully differentiated from the irregular action due to the occurrence of extrasystoles. The irregularity due to extrasystoles results from the occasional response of the heart to a stimulus originating at some point other than the normal site. In fibrillation of the auricles the condition is entirely different: there is no co-ordinate contraction of the auricular muscle; the whole auricle passes into a tremulous state devoid of driving force. Stimuli are showered down haphazard on to the ventricles from the fibrillating auricles, and the ventricles respond in an absolutely disorderly manner; the stimuli to which they respond are without rhythm, and the action of the ventricles is correspondingly irregular. It is this characteristic lack of any rhythm which enables one to recognize these cases without difficulty. Their recognition is essential in the treatment of patients with irregular action of the heart.

Treatment.—The important clinical fact to bear in mind is that, with the onset of fibrillation of the auricle, the work of the heart is at once seriously increased, and therefore the first object of treatment must be to diminish that work so as to give the heart an opportunity to settle down and accommodate itself to its new burden. Rest, slight diminution of the blood-pressure in cases of hypertension, relief of the mental anxiety, and the removal of any detrimental accessory conditions, such as distended stomach or loaded intestine, are all to be aimed at. Drug treatment is to a certain extent tentative. Morphia in small and repeated doses is very valuable where the dyspnœa is distressing, more particularly in patients where there is little if any œdema. Chloral slightly lowers blood-pressure and frequently enables the patient to sleep. There is a widespread and unwarranted fear of this drug. It can be given to those patients for whom morphia has been recommended.

When this disorderly rhythm attacks a patient with mitral stenosis, there is greater hope of effecting an improvement and of slowing the heart by digitalis than in cardiosclerotic patients. In such cases of mitral stenosis suddenly seized with auricular fibrillation, digitalis should be pushed up to the point of producing physiological effects, the object being to depress the conducting power of the auriculo-ventricular bundle. If we are successful, the ventricle receives a very diminished number of stimuli from the auricle, and, as a result of this slowing, the diastolic pauses of the ventricle are prolonged, the heart muscle has an opportunity to recover itself, and the circulation becomes more efficient. The mistake which is usually made in the treatment of such cases is to be afraid of the drug. Twenty drops of an active tincture, strengthened if necessary by $\frac{1}{240}$ gr. of digitalin given four-hourly for the first two days, is not excessive. The real test of saturation is to be found in the appearance of vomiting and nausea, or marked slowing of the pulse with a coupled rhythm. Such indications suggest the desirability of diminution in the dose, or temporary cessation of the drug. It is a good plan to note the total quantity of digitalis required to produce definite slowing of the heart and relief of symptoms for future reference in the event of a second breakdown. It is perhaps hardly necessary to refer to the necessity of thoroughly purging the patient as a preliminary to treatment by digitalis.

Vomiting occurring during the exhibition of the digitalis series is due to two causes (*a*) Local irritation—the stomach resenting the nauseous drug; (*b*) Genuine toxic vomiting. In the former the drug should be stopped for twenty-four hours and then resumed again; this is often enough to allay the sickness; or the dose of digitalis may be given well diluted in half a tumblerful of water, or combined with large doses of bismuth. In the latter case the digitalis must be stopped entirely for some days.

When distress is great and the heart dilated and extremely rapid and irregular, the best results are obtained by an intravenous injection of 1 mgrm. of strophanthin; this can be obtained in sterile ampoules ready for use. Within half an hour of the injection definite relief is often to be observed. The improvement can be maintained by the administration of strophanthus or digitalis by the mouth. The combination of digitalis with mercury and squills is a valuable method of administration.

℞ Pilulæ Hydrargyri | Pulveris Scillæ
Pulveris Digitalis | Extracti Hyoscyami āā gr. j

This pill should not be given continuously where there is evidence of old kidney trouble.

After the distress associated with the inception of the disorderly action of the heart has passed off, many patients settle down to a comfortable life, but with a definite

liminution in their cardiac reserve. Sometimes a small daily dose of digitalis is found ecessary to steady the heart. Often, however, the treatment required is general rather han specific; careful attention to the bowels, a somewhat restricted diet, the correction f any anæmia, and moderate exercise may suffice.

It should not be forgotten that fibrillation of the auricle may occur in paroxysms, he duration of which may vary from minutes to days. Massive doses of digitalis tend o shorten such attacks, and a careful watch should be kept on the heart, so that the reatment can be modified on the cessation of the fibrillation.

3. **Sinus Arrhythmia** is a form of irregular action, common in children and adoles-ents. The irregularity originates at the sino-auricular node, and is dependent on nervous nfluences. It varies with respiration; and since it is a natural phenomenon occurring n healthy individuals it does not require treatment. (*See also* HEART, VALVULAR DISEASES OF; *and* MYOCARDIAL FAILURE.) *John Hay.*

HEART, VALVULAR DISEASES OF.

Chronic Valvular Lesions.—For the purposes of treatment cases of chronic valvular lisease may be divided into two great groups:—

1. Cases in which the lesion is so slight that it produces no practical disturbance of he circulation (no symptoms), and those in which the lesion is more severe but is well ompensated.

2. Cases in which the compensation has broken down, either temporarily or permanently.

This division is of the greatest practical importance, and is not always recognized by he practitioner. Some men when they hear a cardiac murmur immediately prescribe ligitalis or strophanthus as a matter of routine. This is a grave error, and should be studiously avoided. It is essential to remember that in the slighter forms of valvular lefect, and even in more serious lesions so long as the compensation is well maintained, he heart muscle does not require to be helped by cardiac tonics and stimulants. It is qual to its duties; in such circumstances digitalis and strophanthus are unnecessary and ikely to do harm rather than good.

The Treatment of Slight and Compensated Lesions.—The great objects are:—

1. *To prevent Cardiac Strain, and to avoid everything which is likely to Embarrass the Damaged Heart or to Aggravate the Lesion.*—It is important to remember that cardiac strain nay be due either to external causes, such as muscular over-exertion, or to internal causes, such as high blood-pressure, the result of gout, kidney disease, etc.

One of the chief difficulties we have in treating cases of cardiac disease is that, in the abouring classes, the patients are often unable to avoid muscular strain, and that, in the pper classes, patients are often unable or unwilling to avoid dietetic and other conditions which tend to produce gout and high blood-pressure.

2. *To keep the Heart Muscle in the highest possible state of Health and Efficiency.*—In rying to carry out this indication, it is important to attend to the condition of the digestive nd excretory organs, and carefully and judiciously to regulate the daily life of the patient s regards diet, exercise, sleep, clothing, alcohol, tobacco, tea, etc.

During this, the first stage of the disease, drugs (except perhaps the occasional adminis-ration of such remedies as arsenic, strychnine,* and, if the patient is anæmic, iron) are sually not required. Of course, if temporary breakdowns in the compensation occur, he administration of cardiac tonics (digitalis, strophanthus, etc.) is indicated.

Exercise.—It is not always easy to lay down hard and fixed rules as to the amount nd kind of exercise which patients suffering from chronic valvular lesions should be llowed to take; but, generally speaking, one may say that outdoor exercise, *so long as it loes not produce shortness of breath, precordial distress, palpitation, or over-fatigue,* is minently beneficial. Walking is for most patients the best form of exercise; walking

---

* *Prescription for Arsenic and Strychnine in combination.*—(It must be particularly noted that if arsenic nd strychnine are prescribed in the same mixture, the solution must be *acid*, otherwise the strychnine is precipitated, and a poisonous dose is apt to be concentrated at the bottom of the bottle):—

R. Liquoris Arsenici Hydrochlorici	℥j	Acidi Hydrochlorici Diluti	℥ij
Liquoris Strychninæ	℥ij	Liquoris Peptici (Benger's)	q.s. ad ℥iv

M. Sig.: A teaspoonful in water three times daily after food.

on the flat is usually better than hill-climbing, but in those cases in which the reserve power of the heart is but little impaired, a carefully regulated plan of hill-climbing, since it necessitates a greater amount of muscular effort and a more rapid flow of blood through the muscles of the body, is beneficial. All violent efforts, such as running to catch trains, lifting heavy weights, riding a bicycle uphill, against a wind, too far or too fast, etc., and excessive or prolonged muscular work which throws an undue strain on the damaged heart, must of course be prohibited.

Diet.—The diet must be carefully attended to. The food should be nutritious and easily assimilated; patients should be cautioned against over-distending the stomach; the amount of fluid which the patient drinks should in many cases be restricted; a dry diet is often best; articles of food which (for the particular patient) are indigestible should be rigidly prohibited, and anything which produces flatulent distention should be avoided. If flatulent dyspepsia is present, appropriate remedies for its relief (such as alkalis before, and carminatives after, meals) should be prescribed.

If the patient has been accustomed to take alcohol, a strictly moderate quantity may be allowed. A moderate amount of mild tobacco may also be allowed, but over-smoking should be strictly prohibited. Tea and coffee, too, must not be taken in excess. The patient should be warned against over-indulgence in sexual intercourse.

Alkaline Mixture for Cases of Dyspepsia.

℞ Potassii Bicarbonatis, Sodii Bicarbonatis, Spiritus Ammoniæ Aromatici āā ℥iij ℥iv; Tincturæ Rhei ℥ij; Infusi Calumbæ] q.s. ad ℥vj

M. Sig.: A tablespoonful in water three times daily, a quarter of an hour before food.

Note.—In some cases tincture of nux vomica (5 drops) may be added to each dose of the mixture.

Alkaline Cachets for Cases of Dyspepsia.

℞ Potassii Bicarbonatis, Sodii Bicarbonatis āā gr. xv; Pulveris Rhei gr. ij

M. Fiat pulv. cachet; mitte tales xxxvj.

Sig.: One, three times daily, a quarter of an hour before food.

Carminative Tabloid for Flatulence.

Burroughs & Wellcome's soda-mint tabloid, which contains sodii bicarb. gr. iv, ammon. carb. gr. $\frac{1}{12}$, ol. menth. pip. q.s., is an excellent carminative. Two, three, or more tabloids should be swallowed (not sucked) half an hour after food or when the flatulence is troublesome.

Menthol Mixture for Flatulence.

℞ Mentholis gr. iv, Spiritus Ammoniæ Aromatici, Spiritus Chloroformi āā ℥j

M. Sig.: A teaspoonful in water when required.

Note.—The menthol is precipitated when the mixture is added to water, but in a very fine state of division.

It is of great importance to attend to the condition of the great depurative organs (the intestine, the liver, the kidneys, and the skin), for the defective removal of waste products is apt to poison the blood, to interfere with the perfect nutrition of the organs and tissues, including the heart muscle, and to lead to high blood-pressure. Constipation and straining at stool are to be avoided; the patient should see that he has a sufficiently copious evacuation of the bowels every day. Cascara, aloin, tamar indien, or some other suitable laxative should, if necessary, be taken every night. In gouty cases, or where there is high blood-pressure, a watery purge may be given once or twice a week with advantage.

An abundance of sleep and a long rest in bed are in many cases eminently serviceable. Care should be taken that the bedroom is well ventilated and not too hot. A sufficiency of sleep is essential for the due nutrition of the nervous system, the healthy condition of which is one of the most important factors in maintaining the healthy functional activity and nutrition of the tissues and organs of the body, including the heart muscle.

Overwork, and particularly worry, should, if possible, be avoided; rest, recreation,

frequent and long holidays, are to be recommended ; a continuous strain, whether of body or mind, is prejudicial. The subjects of chronic valvular disease should be told in a judicious and tactful way that their hearts are not sound (care being taken, of course, not to frighten them), that they must regulate their lives accordingly, and that they are not able to take liberties with themselves. In selecting a suitable occupation for a young person affected with a chronic valvular lesion, these facts must be kept in view.

All conditions likely to induce a fresh attack of endocarditis (such as acute rheumatism), or which throw a strain upon the damaged heart (such as acute bronchitis), must be carefully guarded against. The subjects of chronic valvular lesions should be well clothed and well housed ; they should wear flannel or silk next the skin. Intercurrent attacks of rheumatism, bronchitis, influenza, common cold, etc., however slight, should be carefully treated.

Such are the general principles which should guide the practitioner in the treatment of the slighter forms of chronic valvular disease and of the more severe forms during the period of satisfactory compensation. It is surprising how long some cases of this kind continue without the development of active symptoms, more especially in private practice.

The Treatment of Temporary Breakdowns of Compensation.—Temporary breakdowns of compensation, in which acute embarrassment and failure of the heart are the result of undue effort, excessive strain, or the development of some intercurrent complication, are of frequent occurrence during the course of chronic valvular lesions. In chronic mitral lesions, for example, an acute attack of bronchitis, which throws an increased strain on the right heart, is frequently attended with the rapid development of serious symptoms (marked shortness of breath, cyanosis, œdema of the feet, etc.). In such circumstances the bronchitis must, of course, be treated by appropriate remedies ; but an all-important point is to aid the enfeebled right heart by the administration of cardiac tonics and stimulants. Digitalis is at this stage of the case an invaluable remedy. In some cases in which the right heart is greatly engorged the strain is best relieved by venesection. In many cases of chronic valvular disease in which acute pulmonary lesions with failure of the heart are developed, I have found great benefit from subcutaneous injections of strychnine (from 2 to 4 min. of the liquor, every six or eight hours) and oxygen inhalations. It is unnecessary to say that, during temporary breakdowns of compensation, complete rest in the position which is most agreeable to the patient, and very careful feeding, are essential ; purgatives, diuretics, antispasmodics, narcotics, and sedatives may also be required, as in the more advanced stages of chronic valvular lesions. As soon as the compensation is again restored, the digitalis or strophanthus may be altogether discontinued, or given in much smaller doses, or alternated with such remedies as arsenic, strychnine, and general tonics. After convalescence from such temporary breakdowns, a carefully regulated course of Nauheim treatment or of Oertel treatment is often beneficial.

The Treatment of Chronic Valvular Lesions after the Breakdown of Compensation.—In those cases of chronic valvular disease in which the lesion is actively progressive, or so severe that the compensation is unable to balance the lesion, a time ultimately, and often speedily, arrives when more active and energetic treatment is required. It is at this stage of the case that digitalis and strophanthus are especially valuable, in conjunction with other measures calculated to relieve the secondary results and complications, such as dropsy, and engorgement of the lungs, digestive organs, and kidneys, which are due to the failure and embarrassment of the circulation. Digitalis is useful in almost all cases and in all forms of chronic valvular disease at some period of their course, but especially in the later stages of mitral disease, in which a rapid and irregular pulse indicates that the auricles are in a state of fibrillation, and when failure of the right heart is manifested by dropsy, and by scanty, high-coloured, and (often) albuminous urine. In my experience digitalis is more useful, and can be given in larger doses and continued for much longer periods of time, in mitral than in aortic regurgitation. When digitalis fails, or for any reason is contra-indicated (in consequence, for example, of idiosyncrasy on the part of the patient, the development of vomiting, etc.), some other cardiac tonic, such as strophanthus, caffeine, etc., must be employed. In many cases of chronic valvular disease there is no marked benefit until the full physiological effects—copious diuresis and slowing of the pulse—of the drug (digitalis) are produced. Several days may be required before these full effects occur. If small or moderate doses of digitalis (5 to 10

min.) do not relieve the symptoms and produce marked benefit, the dose should be increased, unless, of course, for any reason large doses of the remedy (such as 15, 20, or 30 min. of the tincture) seem to be contra-indicated. Over and over again I have seen the most striking benefit result from the administration of large doses of digitalis when small doses (5 to 10 min., three or four times daily) produced little or no benefit.

Patients who are taking full doses of digitalis should be kept under careful observation, in order that the administration of the drug may be discontinued immediately any toxic symptoms make their appearance. Nausea, diminution in the quantity of urine, undue slowing of the pulse or coupling of the heart-beats are some of the most common manifestations that the limits of safety have been reached, and indicate that, for the time being, the drug should be discontinued or the dose considerably reduced.

In the later stages of chronic valvular lesions (i.e., after the compensation has more or less permanently failed), rest is essential; the patient should be allowed to rest (lie or sit) in the position which is most agreeable to him. In cases of this kind the stomach and liver are often engorged, the digestive powers impaired, and the feeding of the patient a matter of difficulty. The diet should be of the lightest kind, and yet as nutritious as possible. Care must be taken to avoid over-distention of the stomach, and to prevent and allay flatulent distention. Dyspeptic symptoms must be carefully treated. In aggravated cases of this kind, I have seen marked benefit from rectal feeding;* by means of rectal feeding, and giving nothing, not even water, by the mouth, the stomach is kept empty, and the flatulent distention, which is in many of these cases a most important cause of cardiac embarrassment, altogether avoided—over and over again I have seen the apex beat which was displaced far outwards to the left return to the normal, or almost to the normal, position, after a week or ten days of rectal feeding. As the result of rectal feeding the engorgement of the venous system is in some degree lessened, the cardiac strain is relieved, and the dilatation of the cardiac cavities becomes materially lessened. The altered position of the apex beat after a course of rectal feeding is partly, I think, due to collapse of the stomach (a mechanical result) and partly to contraction of the heart itself (a most important vital result). The improvement in the general condition of the patient and in the relief of distressing cardiac symptoms which results from rectal feeding in cases of this kind is often most striking, and is in many cases the starting-point of long-continued improvement. At this stage of the disease, dropsy and lung affections are often distressing complications, and require to be met by purgatives, diuretics, massage, and other appropriate therapeutic measures. A salt-free diet seems useful in some cases in which dropsy is a prominent feature.

In those cases of chronic valvular disease—and they are chiefly cases of mitral regurgitation—in which a fatty condition of the cardiac muscle, the result of anæmia, is present, iron (in the chlorotic type) and arsenic (in the pernicious type of anæmia) are by far the most important remedies. In cases of this kind, digitalis and strophanthus are usually, I think, useless, and often harmful.

In those cases in which there is reason to suppose that the valvular lesion is complicated or associated with fatty infiltration and a dilated, flabby heart, careful regulation of the diet and bowels, plenty of fresh air and carefully regulated exercise, together with arsenic and strychnine, are the remedies which I chiefly employ. In this type of case the Nauheim and Oertel plans of treatment are often beneficial. It is, however, always advisable to proceed cautiously and tentatively, and to watch the effect of the exercise and remedies employed; for, in cases of this kind, it is often difficult or impossible to exclude organic conditions of a more serious nature, such as grave myocardial degeneration due to disease of the coronary arteries. When there is advanced organic disease, and particularly when marked degeneration of the cardiac muscle is present, the Nauheim and Oertel plans of treatment require, if employed at all, to be conducted with great care and caution.

---

* Nutrient Enemata.—The nutrient enema which I am in the habit of prescribing consists of two ounces of peptonized milk, half an ounce of raw beef juice or of Wyeth's meat extract, and a raw egg. If necessary, a little brandy may be added. If the rectum becomes irritable, as it often does after prolonged rectal feeding, and if the enemata are not retained, a small quantity of laudanum (8, 12, or 15 drops) may be added to every third or fourth enema. I usually prescribe one nutrient enema every eight hours; and in some cases, also order a nutrient suppository every eight hours, so that the patient has a nutrient enema and suppository alternately every four hours.

In cases of chronic valvular disease associated with high blood-pressure and tightly constricted vessels, the essential objects of treatment are to relieve the cardiac strain, to reduce the blood-pressure, and to tone up the enfeebled heart. The diet must be carefully regulated, the amount of fluid which the patient drinks restricted, and the blood-pressure reduced by saline purgatives and the administration of iodide of potassium or nitrites (nitrite of sodium, nitroglycerin, etc.). Iodide of potassium with arsenic is, I find, a very valuable combination in these cases. In cases of this kind I usually prescribe strophanthus in preference to digitalis. If the patient is gouty, salicylate of sodium, bicarbonate of potash, and piperazine are often useful.

In those cases in which there is reason to believe that the valvular lesion is associated with chronic myocarditis and fibroid degeneration, arsenic, strychnine, digitalis, and, in some cases, iodide of potassium, are, in my experience, the most useful drugs.

In those cases in which angina-like pain is associated with a chronic valvular lesion, the appropriate treatment for angina pectoris must be employed. In dealing with these cases it is of importance to draw a distinction between those in which the blood-pressure is high and those in which it is low. In the former, nitrite of amyl, nitroglycerin, erythrol-tetranitrate, and nitrite of sodium; in the latter, diffusible stimulants and subcutaneous injections of morphia are, in my experience, the best remedies.

The Treatment of Symptoms and Secondary Results.—In the later stages of chronic valvular lesions, the treatment has largely to be directed to the secondary derangements and complications in the lungs, stomach, liver, intestinal tract, kidneys, brain, subcutaneous tissues, and internal cavities. Many of the most important of these derangements and complications, such as dropsy and dyspepsia, are the result of chronic venous engorgement and impaired cardiac power. In dealing with dropsy in the subcutaneous tissues and internal cavities, and other symptoms of this kind, cardiac tonics—more especially digitalis, which, I need not say, is in such cases the best diuretic which we possess—careful regulation of the diet, restriction of the amount of fluid which the patient drinks, watery purges, diuretics, massage, and, in some cases, the mechanical removal of dropsical fluids, are the most important means of treatment.

Hæmoptysis occurring during the earlier stages of mitral stenosis, i.e., when the lesion is satisfactorily compensated, is beneficial rather than the reverse, and does not, unless very profuse, require any active treatment. Hæmoptysis occurring in the later stages of chronic valvular lesions, the result of pulmonary apoplexy and dilatation and failure of the right heart, is of serious significance, and calls for the active administration of digitalis or other cardiac tonic.

Hemiplegia and other conditions due to embolism occurring in the course of mitral stenosis and other forms of chronic valvular disease, and septic endocarditis, which is especially apt to occur in cases in which the valvular apparatus of the heart is affected with chronic disease, have to be treated in accordance with the principles laid down in other parts of this work.

I conclude this article by briefly summarizing my experience as to the value of some of the different measures and remedies employed in the treatment of chronic valvular lesions.

Rest.—In cases of chronic valvular disease in which compensation has broken down, rest (more or less complete in accordance with the special peculiarities of different cases) is, in my opinion, the most important means of treatment which we possess.

Exercise.—This is a very valuable means of treatment in many cases, more particularly during the first stage of valvular lesions, in those cases in which the myocardium is fairly healthy, in which the valvular lesion is associated with neurotic disturbance, and in which the heart muscle is flabby or debilitated as the result of some temporary cause, such as an attack of influenza. In many cases of aortic and mitral disease, in the less severe forms of senile heart, and in the slighter forms of myocardial degeneration, judiciously regulated walking exercise is invaluable, so long as the compensation is well maintained.

By muscular exercise we are enabled to promote the condition of the general health and of the cardiac health, to hasten the circulation through the peripheral organs and through the heart itself, and to prevent stasis and engorgement with all their disastrous results. So long as exercise does not produce marked shortness of breath, over-fatigue, or other untoward symptoms, it should, I think, be not only permitted but encouraged.

Mental Therapeutics.—I attach the greatest importance to sustaining the mental tone of the patient and encouraging him to hope that the treatment will be attended with success. A favourable opinion confidently expressed has often a most beneficial effect, more particularly in those cases in which the valvular lesion is well compensated, associated with a nervous and irritable condition of the heart, or in which the patient is of an anxious, nervous temperament.

Iron.—This is an invaluable remedy in those cases in which the valvular lesion is associated with, or due to, deficiency of hæmoglobin (the chlorotic type of anæmia); the preparation of iron which I like best in cases of this kind is the Blaud-pill capsule (one, two, or three No. 3 capsules, three times daily).

Arsenic.—This is a valuable cardiac tonic in many cases of valvular disease, more especially during the first stage, in cases in which a temporary breakdown of compensation has been recovered from under the administration of digitalis or other cardiac tonics, and in many cases in which there is angina pain, and fatty or fibroid degeneration. Speaking generally, I find arsenic is more useful in aortic than in mitral cases.

Strychnine.—This I consider is one of the most useful remedies which we possess. I find it very valuable in many cases of valvular disease before there has been a decided breakdown of compensation; in these cases I often give it in combination with arsenic. Strychnine is also very useful in some cases during temporary breakdowns of compensation, especially when there are bronchial or other pulmonary complications; in cases of this kind I rely chiefly on subcutaneous injections of strychnine, inhalations of oxygen, and digitalis or strophanthus.

Digitalis.—It is unnecessary to say that this is by far the most valuable cardiac tonic we possess, for the purpose of producing both immediate and lasting effects—tiding the patient over acute complications, and permanently sustaining the cardiac power and preventing further breakdowns of compensation. I agree with those who think that digitalis is more useful in mitral than in aortic cases; it is especially valuable in cases of mitral regurgitation with dropsy, quick, irregular, or intermittent pulse, scanty, high-coloured urine loaded with urates, etc. In cases of this kind, the dose should be increased until the full physiological effects (slowing of the pulse, diuresis, etc.) are produced. Digitalis should be given more cautiously, and for shorter periods of time, in cases of aortic regurgitation; in cases of this kind it cannot be expected to produce, and as a matter of fact does not produce, such satisfactory results as in those of mitral regurgitation. When mitral regurgitation is superadded to aortic disease, digitalis is often very useful. Digitalis should, I think, be cautiously given in cases in which there is reason to suppose that the cardiac muscle is markedly fatty; it is beneficial in some cases in which there seem to be chronic myocarditis and fibroid degeneration. Where the pulse tension is high, I usually prescribe strophanthus in preference to digitalis. In such circumstances, if digitalis is given, I usually combine it with iodide of potassium, salicylate of sodium, or some remedy—such as nitroglycerin or nitrite of sodium—which reduces blood-pressure.

I usually give digitalis in the form of tincture (5 to 30 min.) or infusion ($\frac{1}{2}$ oz. to 1 oz.); the powder given in the form of pill ($\frac{1}{2}$ to 2 gr.) is also an excellent preparation; in some cases, Nativelle's granules ($\frac{1}{240}$ gr.)—1, 2, or 3 in the twenty-four hours—are undoubtedly most valuable, more especially in cases in which it is necessary to produce the full effect of the remedy with rapidity, and in some cases in which the liquid preparations of digitalis produce vomiting and gastro-intestinal derangement.

Strophanthus.—I usually prescribe strophanthus (2 to 5 min. of the tincture) in preference to digitalis in those cases of chronic valvular disease in which the blood-pressure is increased, in cases in which one wishes to produce a rapid effect, and in which digitalis, owing, perhaps, to some idiosyncrasy of the patient, disagrees.

Caffeine.—This is a valuable cardiac tonic, and should be tried when digitalis and strophanthus fail (dose, 3 to 10 gr. of the citrate, three times daily).

Alcoholic, Ammoniacal, and Ethereal Stimulants are of great use for the purpose of relieving urgent symptoms and warding off asystole. In those cases in which there is vomiting, brandy and champagne are, I think, the most useful forms. Of recent years I have prescribed alcohol much less freely than I formerly did.

Oxygen Inhalations.—Inhalations of oxygen are, I think, of great value in some cases of chronic valvular disease in which cyanosis due to respiratory embarrassment

is a prominent feature, especially where there is bronchitis, pneumonia, or pulmonary apoplexy.

Iodide of potassium (5 to 20 gr., three times daily).—This is a very valuable remedy in some cases of aortic disease, in valvular lesions associated with angina pectoris, mitral regurgitation associated with high blood-pressure, gouty conditions, and in cases in which there is reason to suspect that the valvular lesion or the arterial disease which is associated with it is the result of syphilis.

Salicylate of Sodium (5 to 20 gr., three times daily).—This is a remedy which I often prescribe in valvular lesions associated with gouty and rheumatic symptoms.

Nitroglycerin (1 to 3 drops of a 1 per cent solution), *Nitrite of Amyl* (3 to 5 drops by inhalation, repeated if necessary), *Erythroltetranitrate* ($\frac{1}{2}$ to 1 gr.), and *Nitrite of Sodium* ($\frac{1}{2}$ to 3 gr.).—These remedies are very valuable in cases in which valvular lesions are associated with high blood-pressure or angina pectoris.

Menthol.—This remedy is very useful in many cases in which flatulent distention of the stomach occurs in the course of valvular lesions. I usually give $\frac{1}{8}$ gr. or $\frac{1}{4}$ gr. of solid menthol dissolved in $\frac{1}{2}$ drachm of spirits of ammonia and $\frac{1}{2}$ drachm of spirits of chloroform for a dose.

Rectal Feeding.—In several cases of advanced valvular disease in which compensation has broken down, and in some cases of dilated heart apparently due to chronic degeneration of the cardiac muscle, I have seen marked benefit result from rectal feeding. The contraction of the stomach and the disappearance of the flatulent distention seemed to be the chief factors in the production of this improvement.

Purgatives—especially mercurials and salines—are, it is needless to say, most useful in many valvular lesions, especially in mitral cases attended with dropsy, and in cases in which the right side of the heart is over-distended and the tissues are engorged and waterlogged.

Diuretics.—In many cases in which the urine is scanty, more especially in mitral regurgitation with dropsy and in the advanced stages of cases in which compensation has failed whatever the nature of the valvular lesion, diuretics are of great value: digitalis, strophanthus, caffeine, theobromine sodium salicylate (10 to 40 gr.), a combination of digitalis, squill, and mercury, the salts of potash (bitartrate, acetate, citrate, 20 to 30 gr.), and the nitrites (such as nitrite of sodium $\frac{1}{2}$ to 3 gr.) are some of the most useful drugs.

The Mechanical Removal of Dropsical Effusions.—In the advanced stages of many cases of valvular disease, the removal of dropsical fluid from the internal cavities, especially from the pleura and peritoneum, is sometimes attended with marked benefit. I never puncture the dropsical legs or scrotum, either by simple puncture or by means of Southey's tubes, until other measures have been fully tried and have failed to give relief.

Massage.—When subcutaneous dropsy is present, this is often a useful means of treatment; it aids the venous and lymphatic return, and quickens the circulation in the muscular and peripheral tissues of the body. It is also of great use in many cases of valvular disease unattended with dropsy, in which, owing either to the nature of the lesion, the presence of shortness of breath, or other symptoms, ordinary muscular exercise is contra-indicated.

Venesection.—This is undoubtedly valuable in some cases in which the right heart is greatly over-distended and engorged, and is particularly useful, I think, when the engorgement depends upon temporary lung complications, superadded to mitral disease.

Dry Cupping.—This is useful in some cases for the relief of congestion of the lungs and other pulmonary and kidney complications.

Sedatives and Soporifics.—The soporifics which I chiefly use are trional (10 to 30 gr.), chloral formamide (10 to 30 gr.), paraldehyde (1 to 4 drachms), and morphia ($\frac{1}{8}$ to $\frac{1}{2}$ gr.). Sulphonal (10 to 30 gr.) is, I think, less certain in its action than chloral formamide. I seldom give chloral hydrate in grave cardiac cases, on account of the marked depression which it sometimes produces. Paraldehyde is often very useful, especially, I think, in cases associated with bronchitis or other pulmonary complications, and in which morphia is contra-indicated. After the breakdown in compensation, and in the distressing restlessness, dyspnœa, and orthopnœa of advanced valvular lesions, small and frequently repeated doses of opium ($\frac{1}{2}$ to 1 gr.) or morphia ($\frac{1}{8}$ to $\frac{1}{4}$ gr.) are invaluable. The presence of albumin in the urine and of kidney disease is not, in my experience, a contra-indication, though in

such conditions morphia and opium must, of course, be employed with caution. Morphia should not be given when there is œdema of the lungs or much bronchial secretion. (*See also* MYOCARDIAL FAILURE.) *Byrom Bramwell.*

HEARTBURN.—Though heartburn may be associated with hyperacidity, it is not identical with it, and in many cases is apparently a neurosis due to hyperæsthesia of the gastric mucous membrane.

If hyperacidity is present, the dietetic and other treatment is the same as in hyperchlorhydria (q.v.). In the neurosis cases treatment is often unsatisfactory. There is no one diet which will suit all, and it is necessary to be guided largely by the patient's own experience of what suits him. As a rule milk and cream are not well borne. Strong tea and red wines are always harmful. Some patients do moderately well on carefully prepared cereals and vegetable purées ; others do better on boiled or broiled lean meats and fish. In regard to drugs, soluble alkalis should be avoided, but ar antacid lozenge may afford temporary relief. A course of bromides is often beneficial. *Robert Hutchison.*

HEAT APOPLEXY.—(*See* SUNSTROKE.)

HELIOTHERAPY.—This consists in the exposure of the skin surface to the sun's rays when the latter are hot enough to produce perspiration. To effect this, however, it is practically always necessary to wrap the patient in a blanket after a period of exposure. The patient should first lie on a mattress, covered with a blanket, facing south and sheltered from the wind. The patient lies on the blanket divested of all clothing. The head and nape of the neck should be protected by a screen or fan, but a hat should not be worn. At first the position of the body should be changed every two or three minutes by turning to one side or another.

When two-thirds of the time for the bath have elapsed, the patient should wrap himself entirely in the blanket. When subjected to the direct rays of the sun the body is thoroughly heated ; and once it is wrapped in the blanket after due exposure, profuse perspiration usually takes place.

The first portion of the bath is called the *direct* bath and the second the *indirect* bath. At the beginning of a course the bath should not last more than fifteen minutes, but can gradually be lengthened until it lasts for an hour or more.

The best time for taking the sun-bath is in the morning or early in the afternoon. In cloudy weather the bath must be prolonged a quarter of an hour or more ; and sunshine being entirely lacking, it is rather a light- than a sun-bath. As sequelæ we sometimes have languor and headache, these being usually due to too prolonged a bath. They are also more frequent in patients who do not perspire readily, and in such types blanket wrapping must be applied sooner.

One of the effects of the sun is to close the pores of the skin, though at the same time attracting waste matter from the body to the skin surface ; under these conditions dermatitis and erythema of a painful and distressing character may be induced. As a rule, timely application of the blanket prevents these complications.

The Grecian practice of giving sun-baths *in arenaria*—the patients using sand to cover themselves partially—has been perpetuated at Battle Creek Sanatorium. The best way is to cover almost the whole body in a layer of warm sand 5 to 6 inches in thickness.

Cases of rheumatism benefit materially from such treatment, as also gout, and, indeed, all arthritic diseases. For cases of obesity two baths every twenty-four hours are advised. In uterine and other abdominal-organ congestions the functions of the skin are stimulated and the congestion relieved. Less frequent baths are helpful in certain conditions of anæmia and neurasthenia.

Cooling processes are not always called for after the bath, but it is very customary to have a brief shower-bath or sponge-down with a wet cloth or sponge, drying being effected by a brief run. *T. D. Luke.*

HEMIPLEGIA.—In this article, the condition rather than its causes will be dealt with. Reference will be made almost entirely to cases of ordinary hemiplegia dependent upon a vascular lesion which has damaged some portion of the motor tract, from the

cortex to the base of the brain; and remarks as to treatment will not apply to hemiplegia due to neoplasm, meningitis, or abscess. In the latter cases, treatment can aim only at removal of the cause, though, if this can be accomplished successfully, the question of treating paralysis resulting from the original lesion may still arise.

In all cases it will be assumed that we are dealing with hemiplegia caused by vascular lesions, hæmorrhagic, embolic, or thrombotic, and that the causes of these conditions, such as arteritis, specific or otherwise, valvular heart disease, nephritis, anæmia, and other diseases of the blood, receive attention. The gravity of any of these conditions may render treatment of resultant hemiplegia quite a secondary consideration, for any active treatment of hemiplegia in a subject with one foot in the grave would only accelerate his downward progress.

Treatment of hemiplegia itself is unavailing, or unsatisfactory:—

1. When it is due to neoplasms or abscess.

2. In elderly, broken-down subjects of advanced Bright's disease, widespread atheroma, diabetes, severe valvular heart disease.

3. In cases of progressive cortical softening, with mental changes.

4. In cases of long-standing hemiplegia, in which there is evidence of complete degeneration of a considerable portion of the motor tract.

Treatment.—Many patients are not treated at all. Doubtless they receive plenty of iodide of potassium, strychnine, and other drugs; but so far as the paralysis is concerned, they are too often left to themselves. The blame for this rests partly on the public. Paralysis, to the public, means incurability; a rooted conviction prevails that a person who has had one stroke of paralysis is bound to have another, and yet a third, which will be infallibly fatal. Medical attendance is therefore discouraged as useless, and the medical attendant soon receives a more or less polite intimation that his visits need not be continued, and that he will be 'sent for if wanted'—that is to say, for incidental ailments, or should the patient have another stroke, and appear at death's door. Neglect of hemiplegic patients may be attributed also to the pessimistic teaching that those who get well do so without treatment, and those who do not get well derive no benefit from treatment. Neither statement is strictly true. Mild cases may never recover unless treated; and severe cases, unless treated, may go from bad to worse. It must be freely admitted that, unfortunately, little or nothing can be done for a patient when the greater part of one of his motor tracts has been totally destroyed; yet the existence of such destruction should not be too readily assumed. Its presence may be simulated by a purely functional inability to make use of the powers which have been actually restored. Many a patient who is admitted to hospital complaining that his arm and leg have been absolutely useless for months, discovers, when the fact is pointed out to him, that the limbs are not so powerless as they seemed, and from that time daily makes fresh discoveries which cheer him.

In a severe case of hemiplegia of from six to twelve months' duration or longer, the patient's arm and leg may be quite useless and immobile. He is unable to stand or walk. His joints are fixed, and any attempt to move them causes extreme pain; his shoulder is usually adducted to his side, his elbow and wrist are flexed, his forearm is pronated and held across his chest, and his fingers and thumb are doubled into the palm of his hand. His hip and knee also may be flexed, though more commonly extended, his thigh adducted, his knee and foot inverted, and his heel drawn up. The muscles are all wasted, and some are shortened and contracted, thus causing the characteristic pose of the limbs which cannot be overcome, and the tendon reflexes are exaggerated. There may be œdema, lividity, pain, tenderness, and hyperæsthesia of the limbs. This is the extreme and incurable state of helplessness at which the sufferer from hemiplegia may arrive. The immobility of the limbs is due (1) To articular adhesions; (2) To motor paralysis leading to muscular atrophy; and (3) To spasticity or spasmodic contraction of certain muscles, leading to permanent shortening of those most affected. These conditions in an advanced stage are incurable; but I submit that systematic and intelligent treatment from the first would lessen the number of incurable patients, and would alleviate the lot of those not cured.

Besides these far advanced and perhaps irremediable cases, we meet with others in which disablement is only partial. In the majority it is the arm which remains helpless.

Sometimes it is in the condition already described, sometimes—long after a stroke has occurred—the limb remains powerless, wasted, and flaccid, though spasticity is absent. These are frequently most amenable to treatment, and to them further allusion will be made. It is important to grasp the fact that the great majority of cases of hemiplegia tend towards an at all events partial recovery. Yet such recovery is rarely spontaneous in lethargic, despondent, and timid subjects. These must be taught to realize the power which they have regained but do not use.

Functional or Hysterical Paralysis supervening on genuine Hemiplegia.—Sometimes, long after structural damage causing organic hemiplegia has been repaired, one limb, usually the arm, remains absolutely powerless. It dangles loosely at the patient's side, and when he wishes to alter its position, he will pick it up with his sound hand and throw it carelessly on his knee, or on the table, as desired. The limb may be slightly wasted, cold, and all forms of sensation may be blunted. The tendon-jerks are active. Rigidity is entirely absent, but on manipulating the limb, and performing rough unexpected passive movements, the muscles will be felt to contract slightly in resistance, and then become flaccid again as before. There may or may not be restriction of fields of vision and other hysterical stigmata in such cases, but the condition described is suggestive of the functional nature of the paralysis, and is usually promptly cured by a few applications of the electrical wire brush.

More frequently such cases enlarge the roll of miracles performed at the shrines of saints and quacks. It should be remembered that functional disablement may outlast organic lesions.

The Methods of Treatment at our disposal are :—

(1) *Passive Movements;* (2) *Mechanotherapeutics;* (3) *Massage and Electricity;* (4) *Re-education of Movements* by passive and active exercises, combined with encouragement and suggestion.

1. **Passive Movements.**—*Articular adhesions* frequently cause limitation of movements. They may occur in the elbow, the wrist, the hip, the knee, and the ankle, but are most common and are formed earliest in the shoulder, rendering movements of the joint painful, if not impossible. A limb which might have recovered is often useless owing to their presence. Some regard adhesions as trophic, others as rheumatic, in origin. In advanced cases, changes indistinguishable from those of rheumatoid arthritis may be induced, especially in patients who already have signs of that disease. The nerves in the neighbourhood of the joints may be involved, and give rise to the painful symptoms of peripheral neuritis. Whatever be their cause, in many cases adhesions are preventable. Unfortunately, it happens too often that in early days of hemiplegia a dread is entertained lest any disturbance of the patient should cause further hæmorrhage or other mischief in the brain. So he is left to cuddle and caress his paralyzed arm to his heart's content. He usually hugs it to his side, and flexes his elbow and forearm across his chest in the very position it is desirable to avoid. This fear of moving the limbs is quite unfounded. Gentle passive movements of each joint should be practised many times a day from the very first: for adhesions begin to form very early in the first week or two, during which it is advisable to confine the patient to bed. When formed, they are difficult to disperse; hence the importance of preventing their occurrence, or dealing with them early. Neglected adhesions soon become permanent. Arthritic adhesions are, however, often absent, and fixation of joints is due solely to muscular contraction.

Treatment of Early Rigidity.—The early treatment of this condition is as important as is that for the prevention of articular adhesions. Almost from the first the limbs tend to assume the attitude which may afterwards become permanent. Therefore, even whilst the patient is confined to bed, all faulty positions and any tendency to adopt a particular position should be corrected. Adduction of the shoulder may be prevented by placing a sand-bag in the axilla. The elbow should be kept extended rather than flexed; the tendency to flexion is easily overcome in early stages. Advantage may be taken of the curious consolation which the patient derives from playing with his paralyzed arm, by instructing him to alter its position himself from time to time with his sound hand. Faulty positions of the lower extremity should be similarly treated. The limb should be rotated outwards and abducted, and the foot dorsiflexed and everted, in order to obviate the tendency to assume opposite positions. Spasm of the hip flexors is rare,

but when it occurs it may be counteracted by placing a pillow beneath the buttocks. Contraction of the hamstrings should be treated by raising the heel. Sand-bags may be used to ensure favourable position of the limbs. When the patient leaves his bed, similar precautions should be taken against malposition. He should never be allowed to carry his arm in a sling, but should keep it dependent as far as possible, only flexing it from time to time should œdema appear. He should not be allowed to sit with his knees and toes turned in, but should be told to correct these positions himself. The first principles of treatment, therefore, aim at prevention of fixation of joints and faulty positions of limbs.

2. **Mechanotherapeutics.** — When early rigidity is marked and progressive, the constant tendency to flexion of the elbow, with pronation of forearm and flexion of wrist, should be treated by applying a back splint to the limb, care being taken to avoid undue pressure.

Flexion of fingers and thumb only may be combated by placing indiarubber balls, graduated in size, in the palm of the hand. When raising the heel and buttocks fails to remedy flexion of the hip and knee, an extension apparatus should be applied, whilst sand-bags are used in order to counteract rotation inwards of the limb, and a 'Scarpa's' shoe to obviate plantar flexion of the foot. Such apparatus should be used only so long as the patient is confined to bed. As soon as he is able to get up, the appliances should be worn at night only, and by day passive movements should take their place. When possible these should be carried out by the patient himself.

An excellent exercise for the patient with a paralyzed and stiffening arm is to interlace the fingers with those of his other hand, and then, helping the paralyzed by the sound limb, to imitate the movement of rowing with both. Thus the contracted fingers are expanded, the wrist and triceps extended, and the biceps relaxed, in one procedure.

3. **Massage and Electricity.**—Massage arrests atrophy, promotes muscular growth, prevents œdema, improves the circulation of blood and lymph, renders the joints supple, and probably has a direct action on nerves and nerve centres; but massage, unless employed with gentleness and intelligence, does more harm than good. It is useless to leave a masseur who has learnt the mysteries of *effleurage*, *pétrissage*, *tapotement*, and *hachage* in six easy lessons, to work his will on the patient. The crude methods of the ordinary shampooer are not applicable to the sufferer from hemiplegia.

Having secured the services of a competent masseur, we have yet to teach him what to do. It has already been mentioned that spasticity tends to affect certain muscles more than others, and that those most affected may become permanently contracted. Contracting or contracted muscles should never be forcibly stretched, but be coaxed to relax by gentle steady traction and stroking (effleurage). Rough kneading (pétrissage) and thumping (hachage) stimulate muscles to further contraction, and therefore should not be applied to those which are already in hypertonic condition. On the other hand, the more vigorous methods of massage are useful in improving the tone of individual uncontracted muscles, and thus enabling them to counteract their contracting opponents. Effleurage, or stroking, promotes general circulation in the limbs. A combination of centripetal and centrifugal massage is perhaps most efficacious. The efficacy of massage is increased by previous immersion of the limbs in a warm bath. Cold always aggravates rigidity, and it is essential to keep paralyzed limbs warmly wrapped with cotton-wool or Jaeger from the first.

Electricity, whether faradic or galvanic, is a useful adjunct to massage, but cannot take its place. If faradism and galvanism have been discredited in the treatment of hemiplegia, I believe it is because so-called 'medical electricians' are sometimes over-anxious to give the patient his money's worth. The currents which they employ are often far too strong, their negative electrodes are too small, and they alarm and hurt the patient by sudden makes and breaks. Any current which causes pain or produces powerful muscular contraction is too strong, and may do harm.

In old-standing cases, with advanced structural contraction of muscles, electricity is practically useless. Neither faradism nor galvanism should be used until five or six weeks have elapsed since the onset of cerebral hæmorrhage; for the patient is usually in a weak, agitated, and emotional condition during this period, and any sudden pain or shock may determine a fresh attack.

In early rigidity, mild faradism to the extensors and other muscles which show no

signs of contraction is, I believe, of service in promoting their strength and nutrition. But any current strong enough to make them contract forcibly may produce a similar effect on their opponents, which is undesirable : the current should, therefore, be sufficient to excite only slight muscular reaction.

Galvanism may perhaps allay spasm of muscles, and, theoretically, should be applied (the anode mobile) to contracting muscles only. Weak currents only of 1 to 5 ma. are admissible ; sudden makes and breaks should be avoided ; the currents should be turned on and off gradually, and electrodes should be large, especially the stabile one. No séance should exceed ten minutes, once daily, at first, the period and frequency being cautiously increased. The utility of galvanism is, however, problematical ; central galvanism of the cerebral nerve centres, with a view to ' recharging the cells with activity ', is of therapeutic value only in proportion to the patient's credulity. If the patient professes himself the better for it, he probably feels so, although the improvement may not be apparent to the outside world.

4. **Re-education of Movements and Therapeutic Suggestion.**—So far we have considered the physical causes which impede recovery and the methods of attempting to avert adhesions, late rigidity, and muscular atrophy. It must be admitted that in severe cases treatment at best is only palliative. Complete recovery cannot be expected when a large part of the cerebral motor tract is absolutely destroyed. Yet we can never tell the amount of destruction which has occurred until time has elapsed. The symptoms of an organic lesion are always widely in excess of its extent, so the prospects may not be so hopeless as they appear ; even in the worst cases, a certain amount of improvement may be expected, and its degree will depend on the extent of the damage. We can usually estimate this in a few months' time by the amount of spasticity and atrophy which prevails. Generally speaking, the less the spasticity and wasting the better the prognosis. Motor paralysis is of less grave significance than spasticity.

Occasionally one meets with cases in which, although adhesions, spasticity, and atrophy are slight, or even absent, no improvement is manifested. After many months, or even years, the patient remains as helpless as at first. The reason may be that the patient is unaware that any restoration has taken place. He does not try to use the powers which he has unconsciously regained. He is too depressed and disheartened, too apathetic and resigned to his misfortune, or too timid to attempt to help himself. Apart from such mental conditions, which of course need appropriate treatment, he seems literally to have forgotten how to execute voluntary movements. In re-educating him we are helped by knowledge of the natural order in which recovery occurs. Thus, the leg usually recovers before the arm, the hip and knee before the ankle, the shoulder before the elbow, the elbow before the wrist, whilst the extensors of the fingers, and especially the abductors and extensors of the thumb, are the last to be restored. The rule is that the parts whose movements are more specialized and least associated with movements of the opposite limb are the last to regain power. This knowledge is most valuable, for if we can foretell to the patient that power will return in due order in each limb or joint, and he finds the prophecy true in one instance, he will gain confidence in its truth as regards the rest, and will persevere in his attempts to anticipate progress. He is less apt to mourn over his useless fingers if able to rejoice over a serviceable leg. Therefore we endeavour to fix his attention on the parts which should be recovering rather than on those which are still obviously paralytic. He has to be content to sit up before he can stand, to stand before he can walk, and to move his shoulder before his elbow, his wrist, and his digits ; but he will often be unable to regain any of those powers unless literally taught to do so. The method of teaching is to foresee the dawning approach of power and to elicit it by means of passive movements. It is useless merely to tell such a patient to elevate his arm at the shoulder. He will only sign, 'I cannot' ; but tell him to do so, and at the same time do it for him, and he will gradually learn to raise it himself. At each attempt the operator does less and the patient does more ; so the essence of re-education is in the use of passive and active movements combined.

This principle may be applied in the re-education and amplification of all movements. For instance, a patient has learned to walk, but complains that " one foot is always walking into the other and tripping him up ". On examination we find that he always sits with his knees and toes turned in. He is unaware of the necessity for practising

abduction, rotation outwards, and eversion of the limb, and he is quite unable to execute these movements until taught by passively working the thigh and the foot, and encouraging him to make voluntary efforts to do so at the same time. Similarly, although he knows how greatly foot-drop interferes with his walking, he will not try to dorsiflex his foot unless persuaded. He must be taught to make the effort whilst sitting, helping himself meanwhile by pulling on a strap attached to the fore part of his foot. Or, again, he has never learned to use his hip flexors. He circumducts his leg, or drags it behind him, and has difficulty in getting upstairs. We may teach him to flex his hip on the same principles. When some power has been regained, it may be improved by making him stand, holding the back of a chair, and then directing him to place his affected foot on the rungs, from the lowest upwards. Kouindjy uses miniature staircases for this purpose.

Disordered Association.—The normal *alternate* association of leg movement in walking is often impaired and perverted after hemiplegia. The patient may appear to try to move both legs forward at once. Directly he advances the sound limb the affected one becomes rigid, and is dragged painfully behind. To lessen the difficulty he should be taught to advance the unsound leg before the sound, bringing the latter up to the level of the former after each step. He needs to be lightly supported on the paralyzed side by an attendant, otherwise he will not rest on the affected leg for fear of falling. It is desirable to prevent a fall, of course, but the support which is given should be moral rather than physical. For this reason, the help of an attendant is preferable to that of a stick or crutch. The patient, if able to use either implement, is apt to make it a substitute for his weakened leg instead of an adjuvant.

Ataxy.—Want of precision in movements often follows recovery of both limbs. Exercises on the Fraenkel system for the treatment of locomotor ataxy are useful in such cases. Games such as draughts, halma, or solitaire may be recommended, or targets may be constructed on which the patients practise, touching the bull's-eye and various circles with the forefinger, or the 'Digitorium' or dumb piano may be used. Practice on a type-writing machine has the advantage of being useful as well as remedial. For ataxy of the lower extremity, Fraenkel's various apparatus may be used whilst the patient is lying in bed. He should also stand, supported by the back of a chair, and then, resting on his sound leg, place the foot of his weak one into wooden curtain rings or chalk marks placed in various positions on the floor, touching each in turn as directed.

Apraxia consists in inability to perform at request ordinary actions, such as shaking hands, beckoning, etc., although there is no motor paralysis and the patient perfectly understands what he is asked to do. Liepmann attributes it to interruption of the connections between the cortical centres for the execution of voluntary movement and the sensory centres that lie around them. The outlook is not hopeful, but re-education may perhaps be of service.

Summary.

1. Neglect and want of treatment aggravate severe, and retard the recovery of mild, cases.

2. The evils to be foreseen and guarded against are articular adhesions, late rigidity, and muscular atrophy.

3. Articular adhesions should be prevented by passive movements of each joint from the very first.

4. Faulty positions of the limbs should be constantly corrected, or they will become chronic.

5. Contraction of muscles should be treated by endeavours to improve the nutrition of their uncontracted opponents.

6. Massage, passive movements, and, to a less degree, electricity, should be used with this object. These agents not only counteract muscular atrophy from disuse, but probably take the place of normal stimuli and invigorate the neurones.

7. The recovery of mild cases may be often hastened by re-education of movements. Want of re-education frequently prevents recovery.

8. Re-education consists in a combination of passive and active exercises.

9. Movements should be encouraged first in those parts which naturally tend to recover first.

10. Inco-ordination, and general weakness of limbs which have yet regained power of movement, should be treated by exercises and mechanical therapeutics.

11. It is important to find out what the patient can do, and to make him do it.

In conclusion, this article deals with the treatment of hemiplegia as a condition, without reference to its cause, for whether the cause be hæmorrhage or occlusion of cerebral vessels by embolism or thrombosis is immaterial; the principles of treatment will be the same, and need not interfere with other measures taken for the relief of the disease which gave rise to the hemiplegia. (*See also* APHASIA; APOPLEXY; ELECTROTHERAPEUTICS; PALSIES, CEREBRAL, OF CHILDHOOD.) *Leonard G. Guthrie.*

HEPATIC ABSCESS.—If the presence of hepatic abscess be suspected, the liver must be explored with an aspirator needle, for the earlier the abscess is drained the better are the prospects of recovery. A full-sized aspirator needle should be used, for the pus may not pass through the smaller needles.

When localizing signs are present over any particular area of the liver, puncture should be performed at this spot; otherwise the needle should be inserted through the 8th or 9th intercostal space in the mid-axillary line, and passed towards the upper and posterior part of the liver. If this should fail to find pus, Sir Patrick Manson recommended that at least five other punctures should be made before the attempt to discover pus is abandoned.

OPERATION.—The abscess may be reached either through the abdomen or through the chest wall; most abscesses are situated in the upper and posterior part of the liver, and for these the thoracic operation is preferable.

In the abdominal operation the incision is made through the outer part of the right rectus muscle; the peritoneal cavity is carefully packed off with gauze, unless already shut off with adhesions. The greater part of the pus is removed with the aspirator, the abscess cavity is then opened with a fine scalpel and the finger, and a large tube is inserted. The cavity should not be scraped or irrigated.

In the thoracic operation, a portion of the 9th, 10th, or 11th rib is resected in the scapular line; if the pleural cavity is opened, the upper portion should be closed off with a continuous suture or gauze packing; fibres of the diaphragm are then divided, and the abscess dealt with as in the abdominal operation. *Crisp English.*

HEPATITIS.—In simple hepatitis, rest, and absolute avoidance of alcoholic stimulants and of highly spiced food, are most essential. Diet should be restricted to milk and farinaceous food. Free purgation by calomel, followed by saline aperients, will, as a rule, rapidly reduce the severity of the symptoms.

After such an attack, the diet must be carefully regulated for months, alcohol avoided altogether, and any tendency to constipation corrected by the use of natural waters. Exercise in moderation is to be recommended.

The local application of iodine and biniodide of mercury, or large hot applications, may be used if any tenderness or enlargement of the liver be present. The abdomen must be protected from chill, particularly when the patient is not in bed.

The possibility of the hepatitis being malarial must be considered. If a blood examination shows that there is malaria, quinine in full doses must be given. In the hepatitis associated with dysentery, or where there is a history of dysentery, a course of ipecacuanha or emetine will be most effective. Even if there is no evidence of dysentery, a course of emetine hydrochloride injections should be tried. *C. W. Daniels.*

HERNIA.

INGUINAL HERNIA.

The treatment of inguinal hernia has been greatly influenced by the 'saccular' theory brought forward by Mr. Hamilton Russell some twenty years ago. According to this theory all hernial sacs are congenital and are derived from an unobliterated processus vaginalis. It follows that a so-called 'acquired' hernia is not due to a 'rupture' of the muscles bounding the inguinal canal, but depends upon the forcing of some abdominal viscus into a sac which has been present since birth. There is no primary weakness of the abdominal wall, though a secondary weakness, shown by stretching and thinning

of the muscular and aponeurotic boundaries of the canal, will probably develop in old-standing herniæ. It follows from this theory that the necessary treatment is complete removal of the sac with as little injury as possible to the muscular structures upon the action of which the strength of the inguinal canal depends. In early cases there is no primary weakness, and so there is no need to attempt to strengthen the inguinal canal; but in old-standing cases where secondary weakness is marked, it may be advisable to do so.

1. **Treatment by Trusses.**—This is frequently necessary, either by the patient's choice or because operative treatment is inadvisable. A truss does not cure a hernia, except possibly in infants. It is generally admitted that a tendency for spontaneous obliteration of a patent processus vaginalis may still exist during the first few months of life, so that it is possible a true cure may in some cases result from truss treatment at this period. A truss affords support and prevents any viscus from entering the sac. It is essential that the hernia shall be reducible, and that the truss shall prevent any protrusion into the sac at all times and under all conditions, since, if this takes place behind the truss, there is great danger of strangulation. A second truss with a lighter spring should be worn at night-time, and it is also desirable that a third truss, made of celluloid, should be worn when the patient is in the bath. The truss should be made to measure and selected with care, since, if the fit is not satisfactory, it will be both inefficient and uncomfortable: the spring should be of sufficient strength to afford adequate support, but, if too strong, it will again cause discomfort. A removable linen cover which can be cleaned should be made for the pad, and, to prevent chafing, the skin which bears the pressure must be kept clean and, if necessary, treated with some dusting powder.

2. **Treatment by Operation (Radical Cure of Hernia).** — *Indications*—Generally speaking, operation should be advised in cases of hernia in young adults and in children over the age of one year, unless there is any contra-indication, such as an unsatisfactory condition of the general health. In patients over the age of forty, increasing care must be taken in the selection of cases. Age, occupation, place of residence, the success or failure of truss treatment, the character of the hernia—i.e., as to whether it is completely reducible—and the condition of the inguinal canal as regards secondary weakness, have all to be taken into account. A truss is not required after an ordinary radical cure, but in some cases operation is permissible to enable a patient to wear a truss in comfort rather than with a view to a true cure.

Many operations for the cure of hernia have been devised, but the following are the measures more commonly employed.

a. Simple Excision of the Sac.—This is especially indicated in young adults and in children, where there is little or no secondary weakness, and where the muscles either have not yet reached their full development, or at any rate may be expected to improve. Indeed, in such cases suturing or laceration of the muscular structures will be followed by a fibroid change which may actually increase the weakness. The sac, which may, if desired, be exposed and separated from the spermatic cord by an incision in the external oblique without dividing the external abdominal ring, should be ligatured rather above the level of the internal ring, so that no funnel-shaped depression is left in the peritoneum which might be the starting-point for a recurrence of the hernia.

b. Kocher's Operation.—The sac is exposed and isolated below the external abdominal ring, and, after it has been emptied, the lower end is seized by curved dressing-forceps, which are pushed up the inguinal canal immediately behind its anterior wall as far as the internal abdominal ring. The points of the forceps are now pushed forwards and protruded through a small incision which is made in the external oblique aponeurosis. The sac is drawn through this opening, transfixed, ligatured, and removed.

c. Bassini's Operation.—In this operation, which is especially indicated when secondary weakness is present, the inguinal canal is opened up, and, after the sac has been dissected away from the cord and removed, the conjoined tendon is sutured to the deep aspect of Poupart's ligament. These sutures, which are passed behind the spermatic cord, can also be applied when the sac has been removed through the incision in the external oblique without dividing the external ring.

Inguinal Hernia in Women.—This should be treated on the lines given above. The operative treatment is similar, but the round ligament, which takes the place of the

spermatic cord of the male, is often most intimately connected with the sac. Under these circumstances it is best not to attempt separation, but to remove the two structures together.

Hernia in Infants.—Generally speaking, operation is best postponed until the child is twelve months old, but after this age, unless there is some contra-indication, all herniæ ought to be treated by operation. This is simple, complete removal of the sac being alone required ; the risk is slight, and the results are excellent. Operation should be performed in an infant under the age of twelve months if the hernia is large or uncontrollable, or if it becomes irreducible. Otherwise a skein-of-wool truss or a pneumatic rubber truss should be employed.

Strangulated Hernia.—If the case is seen early, gentle taxis may be tried after the patient has been given a hot bath. He should be placed on his back with the buttocks raised by means of a pillow, and the legs slightly flexed so as to relax the parts as much as possible. The swelling should be gently compressed so as to press out some of the contents, and if this is successful the hernia should be pressed upwards towards the internal ring. The application of an ice-bag, though often advised, is not devoid of danger, and if employed must be used with caution. In any case all manipulation must be gentle, and unless quickly successful it is best to resort to operation.

Operation for Strangulated Hernia.—The inguinal canal is opened up by incising the external oblique in an upward and outward direction from the external ring, and the distended hernial sac is exposed and separated from the spermatic cord. The sac is now carefully opened and the contents investigated. When the sac is incised, fluid usually escapes ; the character of this should be noted, for if foul and brown in colour the gut is probably gangrenous. It is next necessary to examine the site of constriction and relieve the strangulation. A flat hernia director is passed upwards through the neck of the sac into the abdominal cavity ; a hernia knife is gently pushed along the groove in the director, and the neck of the sac nicked in an upward and outward direction so as to avoid the deep epigastric artery. The contents can now be drawn downwards and the condition of the bowel carefully investigated, especially at the line of constriction. The colour of the bowel alone may be misleading, for it may be so deeply congested as to be black in colour and yet be perfectly recoverable ; any grey or green discoloration is far more serious, and is much more characteristic of gangrene than purple or black. Loss of resiliency in the bowel, and dulling of the peritoneal surface, are also indications of gangrene. If the condition of the bowel is satisfactory, it is returned to the abdomen, the sac removed, and the wound closed.

If the bowel is gangrenous or has perforated, one of three courses can be adopted : (1) The gangrenous area, if small, such as is sometimes found at the line of constriction, may be infolded by a purse-string suture, or by Lembert's sutures. (2) The gangrenous coil may be drawn into the wound and excised, an end-to-end, or better a lateral, anastomosis being then performed ; or, if the condition of the patient contra-indicates this at the time, a Paul's tube may be tied into each end of the divided intestine, and the anastomosis performed after an interval of some days when the condition has improved. (3) When the state of the patient is very grave, the damaged intestine may be left in the wound and incised so as to form an enterostomy.

Strangulation is unusual in children, and when a hernia is irreducible it can usually be reduced by taxis, especially if an anæsthetic be given. Another good plan is to place the child in bed and to sling it up by the legs so that the weight of the intestines tends to help reduction. If taxis fails, operation should at once be proceeded with.

Femoral Hernia.

The spring of a femoral truss is lighter than that of an inguinal truss ; the pad is smaller, and should incline more downwards so that pressure is applied to the crural canal below Poupart's ligament. As it is important that the truss should not press upon the spine of the pubis or upon the femoral vein, care must be taken to ensure a proper fit. Most cases of femoral hernia in middle-aged or elderly women can be satisfactorily treated in this way.

In younger patients, and in those where the hernia is irreducible, or where truss treatment is unsatisfactory, an operation for radical cure may be undertaken. A vertical

incision is made over the hernia, the sac is exposed, freed right up to the crural canal, and then emptied, transfixed, and ligatured. The ends of the ligature may be left long, and are grasped by a pair of curved dressing-forceps, which are passed along the crural canal and made to impinge upon the abdominal wall just above Poupart's ligament. A small incision may be made in the external oblique, and a nick made over the points of the forceps, which are pushed through, and the ends of the ligature secured. By traction upon these the stump of the sac is drawn above the crural canal; each end is in turn threaded through a needle, which is passed through the internal oblique, after which they are tied together, fixing the stump in this position. If considered desirable, the canal may be closed by a few sutures passing between Cooper's ligament and Poupart's ligament, care being taken not to injure or compress the femoral vein.

Strangulation of a femoral hernia, which is more serious than strangulation of an inguinal hernia, should be treated upon similar lines. Taxis is, however, less likely to succeed, owing to the small size of the crural canal and the course taken by the hernia. The constricting structure is practically always Gimbernat's ligament, and hence the hernia director and knife must be passed to the inner side.

Umbilical Hernia.

The small umbilical herniæ which are so common in children very seldom require operation; all that is necessary is that support shall be afforded by a binder with a flat pad opposite the umbilicus. Attention should also be directed to improper feeding, constipation, or phimosis.

Far more serious is the umbilical hernia which occurs in adults, usually middle-aged women who have had children. These herniæ tend to become very large, and are generally, owing to adhesions between the omentum and the sac-wall, irreducible; on this account they are very liable to become incarcerated or strangulated. The patients are usually very obese, and are such unsatisfactory subjects for operation that, even when the hernia is irreducible, operation should only be recommended after carefully considering the merits of each individual case. The operation aims at removing the sac and closing the opening in the abdominal wall by suturing the various layers. In many cases excellent results can be obtained by the use of a silver wire filigree, which is inserted between the posterior layer of the rectus sheath and the muscles.

When strangulation occurs, operation is, of course, nearly always necessary, since, owing to adhesions, taxis is very unlikely to be successful. Owing to the condition of the patients the mortality is much greater than in the case of strangulated inguinal or femoral hernia.

Ventral Hernia.

Ventral hernia is the result of the yielding of an operation scar in the abdominal wall. Usually the original operation will have been for some septic condition requiring drainage, such as an appendicular abscess. The size of the hernia, the nature and severity of the symptoms associated with it, and the age and general condition of the patient, will guide one as to whether treatment by an abdominal belt is desirable or whether an attempt should be made to close the gap by operation. If the latter course is decided upon, a wire filigree sutured between the peritoneum and the muscles will, as in the case of an umbilical hernia, be found of the greatest use for strengthening the abdominal wall.

Philip Turner.

HERPES.

Herpes Zoster.—From the nature of the affection, it cannot be expected that any treatment will diminish the actual eruption. The pain by which this is often preceded is usually combated by the administration of morphine, phenazone, etc. Spraying the painful spot with chloride of ethyl has been recently recommended.

When the eruption has commenced to appear, the parts should be protected from irritation in some way. Cotton-wool aud a bandage may be applied: in the writer's opinion the best application is Unna's zinc gelatin, which seems to cut some of the lesions short in the papular stage.

If the vesicles become infected, and suppuration occurs, a weak antiseptic paste (e.g., hydrarg. ammoniat. 5 gr., zinc oxide and vaseline, of each ½ oz.) should be continuously

applied. In most situations the sooner the vesicles dry up into scabs the better; but in supra-orbital herpes, a not uncommon variety of the disease, the formation of scabs tends to make the scars, which almost invariably develop in this situation, only still more evident. It is therefore advisable to keep the part soft with some simple antiseptic ointment, so as to encourage the granulations to reach the level of the surrounding skin. It is still more important in this variety of herpes to keep a close watch on the condition of the eye.

The neuralgia which so often follows zoster, especially in elderly people, is often far more troublesome than the disease itself. The number of remedies suggested for its relief is eloquent testimony to the difficulty of treatment. General tonics, especially arsenic, are usually of some benefit, and galvanism and high-frequency currents are sometimes followed by marked improvement, while a complete change is the most efficacious remedy of all.

Herpes Genitalis is best treated by cleanliness, and the application of a simple dusting powder. It is liable to recur on very slight provocation, and the parts should therefore be protected from irritation of all kinds, particularly sexual. It may not be out of place to note how frequently herpes genitalis is followed by a true Hunterian sore, and the prognosis should always be guarded.

Herpes Labialis.—The cases which develop in connection with pneumonia and other acute conditions require no special treatment, and indeed, in any case not much beyond protection from injury is of any value; but in those constantly recurring eruptions to which, on any slight disturbance of health, many persons are unfortunately liable, something may be done to diminish the severity of the attack by bathing with very hot water when the familiar symptoms first appear. The same result is sometimes achieved by the application of collodion or nitrate of silver. *Norman Walker*

HERPES OPHTHALMICUS.—(*See* CORNEA, DISEASES OF.)

HICCOUGH.—In mild cases the spasm may be arrested by producing a forcible action of the diaphragm, e.g., by holding the breath for a minute, taking a long draught of water, etc. Gentle vertical pressure on the cricoid for some minutes will sometimes arrest the spasm. Some cases are relieved by the patient compressing the diaphragm by lying on his back and bending up the legs and thighs as far as possible on to the abdomen. This position should be maintained for ten minutes at least, and can be repeated if necessary. Warm applications to the region of the diaphragm are of service. An alkaline and carminative draught should be given, e.g., 1 drachm of aromatic spirit of ammonia in 2 oz. of peppermint water, or an aperient draught of rhubarb and magnesia made up with tincture of cardamoms, spirits of chloroform, and peppermint water. If the spasm persists, all solid food should be withheld and one of the following tried:—

1. Nitroglycerin ($\frac{1}{100}$ gr. in tablet form) two or three times a day, or when recurrence threatens.
2. Turpentine (1 dr. in mucilage), or a few drops of oil of cajuput on sugar.
3. Bromides, valerianate of zinc, chloretone, or chloroform in full doses.
4. A pill consisting of 3 min. of creasote and $\frac{1}{8}$ gr. powdered opium.
5. The hypodermic injection of morphia.
6. In hysterical cases success has followed full ether narcosis, the spasm not recurring after recovery of consciousness.
7. Forcible traction on the tongue, maintained for one or two minutes at a time.
8. The application of a blister on each side of the cervical spine over the roots of the third, fourth, and fifth nerves.
9. Faradization of the epigastrium or of the phrenic nerves. *Robert Hutchison*

HIGH ARTERIAL TENSION.—(*See* ATHEROSCLEROSIS.)

HIP, CONGENITAL DISLOCATION OF.—(*See* CONGENITAL DISLOCATION OF HIP.)

HIRSCHSPRUNG'S DISEASE.—(*See* CONGENITAL DILATATION OF THE COLON.)

HORDEOLUM.—(*See* EYELIDS, DISEASES OF.)

HYDROCELE.

Acute Hydrocele occurs as a complication of acute inflammatory conditions of the testis or epididymis. The treatment of the hydrocele is a secondary consideration in these cases. If the sac becomes tensely distended with fluid and is the cause of pain, it may be tapped with trocar and cannula.

Chronic Hydrocele.—The following conditions are included under this name: Hydrocele complicating chronic diseases of the testicle or epididymis, chronic vaginal hydrocele, spermatocele, encysted hydrocele of the cord, congenital hydrocele, and infantile hydrocele.

1. *Chronic Hydrocele complicating Diseases of the Testicle or Epididymis* may rarely require treatment. The hydrocele may then be tapped with trocar and cannula. No injection of irritating fluids is permissible, nor should operative procedures be adopted apart from the treatment of the causative disease.

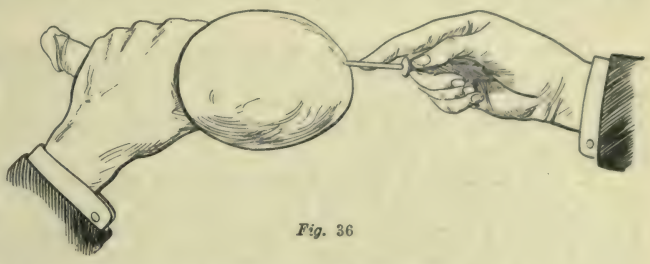


Fig. 36

2. *Chronic Vaginal Hydrocele* is the common form of hydrocele that requires treatment. This may consist in (*a*) Tapping; (*b*) Tapping followed by injection; (*c*) Excision or other cutting operation.

a. The simplest method is tapping by means of a trocar and cannula. The sac refills in from four to six months; rarely it fills rapidly and is tense in three weeks. The cannula should have a fine calibre: a large instrument causes unnecessary pain, and may give rise to bleeding. The following precautions should be taken before tapping a hydrocele. A hernia in close relation to the sac should be reduced, or, at least, its position clearly defined. The position of the testicle must be ascertained by shining a strong light through the hydrocele. The testicle normally lies behind the lower part of the hydrocele, and appears as a narrow crescentic opacity in its wall. The position of large scrotal veins should be noted. The skin of the scrotum must be washed with an antiseptic, or a small area painted with tincture of iodine, and the trocar and cannula sterilized.

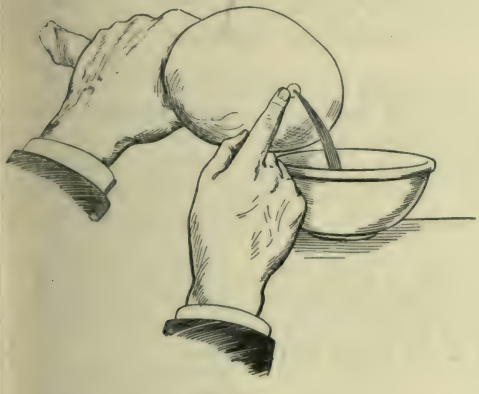


Fig. 37.

Method of Tapping.—The patient is recumbent, and the operator stands on his right side. The hydrocele is grasped with the left hand at its upper part, and pressure applied so that the whole cyst is projected downwards to the bottom of the scrotum, and the scrotal wall is stretched tensely over it. By this means the hydrocele is made very tense and the tension sustained, and the wall of the sac is kept in close contact with the stretched scrotal skin. This grasp is maintained from start to finish of the operation. The trocar and cannula is held in the right hand, with the forefinger acting as a guard an inch from the end (*Fig.* 36) to prevent its penetrating too deeply. The instrument is plunged through the wall of the scrotum and sac with a stabbing movement, at a point at the lower part of the anterior surface. This is near the normally-placed testicle, and here the last few drops of fluid will lie. After insertion, the cannula is pushed off the trocar with the forefinger of the right hand, and is pushed in up to its hilt, and held in with this finger during the whole operation (*Fig.* 37). When the last few drops of fluid are expressed the cannula is withdrawn, and the tiny puncture washed with antiseptic lotion. No collodion or other dressing is required.

Accidents may occur during the tapping, and are due to neglect of these precautions. The cannula may slip out of the sac and lie between the skin and the hydrocele. This follows neglect to maintain sufficient tension with the left hand and to support the cannula with the right. The fluid escapes into the areolar tissue of the scrotum. If in quantity, it passes upwards, causing a tense acute œdema of the skin of the penis and mounting up over the abdominal wall. In old people this may lead to dangerous sloughing of the skin. Attempts to repuncture the sac are usually unavailing.

Hæmorrhage into the loose areolar tissue of the scrotum may follow the puncture of a scrotal vein. It is treated by application of an ice-bag and support to the scrotum. Hæmorrhage into the hydrocele sac is usually the result of puncture of the testicle. Similar treatment is adopted here. Later, if the effusion has been considerable, incision and turning out the tarry fluid and clot, followed by a radical cure of the hydrocele, is the best treatment.

Cases in which gangrene of the scrotum has followed the operation of tapping a hydrocele have been recorded. Lack of antiseptic precautions, and a feeble circulation, probably accounted for these cases. A very few patients have been permanently cured by this operation, but it is essentially a palliative measure, and no promise of cure by its employment can be given.

b. The method of tapping and injection aims at a radical cure, but it is uncertain and is now abandoned by all but a very few surgeons. It is carried out as follows: The needle of a large hypodermic syringe is plunged into the sac and left while the syringe is filled with the injection fluid. The hydrocele is now tapped with a trocar and cannula, and when it is quite empty and the cannula removed, the syringe is attached to its needle and the fluid injected. The needle is now withdrawn, and the fluid manipulated through the whole extent of the sac. The scrotum is surrounded with wool, and slung. The patient should remain in bed for one or two days. After injection the fluid rapidly reaccumulates by the pouring out of inflammatory effusion. This is reabsorbed in two or three weeks. If it remains longer the collection may be tapped. Tincture of iodine (Edin. Phar.) has been used for the injection (2 drachms), but has been abandoned for carbolic acid on account of the pain it produces. Sixty minims of a 95 per cent mixture of carbolic crystals with glycerin are used. The carbolic acid numbs the sensation.

c. A cutting operation, consisting of excision of the sac, or turning the sac inside out, or merely displacing the testicle into the areolar tissue of the scrotum, is the method by which cure may be assured. The patient is in bed for a week.

3. *Spermatocele*, if large, may be treated by tapping and injection; or, better, by excision.

4. *Encysted Hydrocele* of the cord should be treated by excision.

5. *Congenital Hydrocele* occurs in infants. The funicular process remains patent, and the hydrocele thus communicates with the abdominal cavity.

If a hernia descends into the sac, a truss should be applied until the infant is old enough (about a year) for a radical operation. Sometimes the truss suffices to obliterate the communication. If the opening is very small, so that no hernia is present, the sac may be tapped, and a cure result.

6. *Infantile Hydrocele.*—The funicular process is closed at the abdominal end, but the rest of the tube remains patent and, together with the tunica vaginalis, forms a large hydrocele. This should be punctured in several places with a surgical needle; failing a cure by this means, it should be tapped with a fine trocar and cannula.

J. W. Thomson Walker.

HYDROCEPHALUS.—This condition must be regarded as a symptom or sequela of a variety of pathological processes, some of which are by no means clearly understood. As an acquired condition it occurs in connection with tumours, more particularly infratentorial, which produce a mechanical block preventing egress of cerebrospinal fluid from the ventricles into the subarachnoid space. In a similar manner, adhesions resulting from meningitis may block the foramina of exit of the fluid in the neighbourhood of the fourth ventricle. The ventricles are variously distended according to the position of the obstruction; thus, with a mid-brain tumour, the fourth ventricle escapes; and in other circumstances, a single foramen of Munro may be obstructed so as to produce distention of one lateral ventricle only. In the 'congenital' form, the fluid may be entirely

ntraventricular; but this is not always the case, and there is not infrequently a free ommunication between the distended ventricles and the distended subarachnoid space. n these cases, abnormalities of secretion by the choroid glands, and anomalies of absorp- ion by the Pacchionian bodies, have been invoked in explanation.

Treatment.—In the cases resulting from tumour pressure, temporary relief may be fforded: (1) By a simple subtentorial decompressive operation; and (2) By ventricular rainage (see below).

The cases due to sealing up of the meningeal foramina, whether by meningitis or some nte-natal cause, may be treated: (1) By repeated ventricular puncture; (2) By stablishing a new communication between the lateral ventricle and the subarachnoid pace, for which a number of different operative procedures have been devised; (3) By aising the cerebellum from the fourth ventricle, after removing the bone and incising he dura of the cerebellar fossa.

Some degree of success has been claimed for all these operations. The last-named is severe procedure attended by considerably greater operative risk than the others. umbar puncture is to be avoided, as carrying with it a considerable risk of sudden death rom herniation of cerebellum and medulla into the foramen magnum. It may be done, owever, as a means of ascertaining whether any ventriculo-subarachnoid communication xists; clearly, when such is the case, the operative procedures mentioned above would e useless. When such communication does exist, repeated lumbar puncture may be ried. Operations have been devised and carried out for draining the subarachnoid space nto the subcutaneous tissues, and even into the peritoneal cavity. Drugs have little if ny influence in hydrocephalus; nor has bandaging of the head, unless as an adjuvant neasure after tapping or drainage.

For tapping the lateral ventricle, the most convenient situation is Keen's point, situated an inch behind and an inch above the external auditory meatus. The cannula s entered at this point, and passed in the direction of the summit of the opposite auricle; he instrument should thus pass through the first temporal gyrus into the widest part of he ventricle. The ventricle has also been tapped through the outer angle of the anterior ontanelle, through the corpus callosum, and through the orbital roof. Whichever route s chosen, the instrument should be a blunt one so as to avoid cutting cerebral vessels; he strictest asepsis must be observed; and urotropine should be administered by the nouth. Too rapid withdrawal of fluid may be followed by hyperpyrexia, convulsions, nd death.

Percy Sargent.

HYDRONEPHROSIS.—This condition in found in varying degrees. It is due to locking of the ureter, and the block may occur at any part. The two most common auses are calculi arrested in their descent from the kidney to the bladder, and kinking f the ureter in marked cases of movable kidney. Occasionally a malignant growth of he cervix uteri or of the ovary will obstruct the ureter, and give rise to hydronephrosis. We have recently seen such a case in which an operation for hydronephrosis had been erformed. Unfortunately the carcinoma of the ovary was overlooked, the wound in he kidney did not heal, and the patient was left with a urinary fistula. It must not be orgotten that the blocking may be produced by intravesical conditions. Thus the uthor has seen more than one case in which the drag of a large villous tumour, the pedicle f which sprang from a point in close proximity to the ureteric meatus, caused so much istortion of the orifice that an immense hydronephrosis resulted. In a somewhat similar way the extension of carcinoma of the bladder to the orifice of the ureter may cause so much occlusion that a hydronephrosis results.

Enlargement of the prostate and stricture of the urethra of long standing are frequently the causes of hydronephrosis, the backward pressure causing dilatation of the bladder, ureters, and pelvis of the kidney consecutively. (*See* Prostate, Enlargement of.)

Treatment.—This consists in removing the cause.

In cases of movable kidney, the condition is usually intermittent, and is signalized by great lumbar pain on the affected side, together with a rapidly-forming swelling, which is very tender on palpation. Very frequently the kidney falls back into its right situation, and this is marked by a sudden considerable flow of urine into the bladder, with subsidence of the swelling and relief of the pain.

Frequently recurring attacks of this nature cause serious damage to the kidney, and must be prevented either by the application of a properly fitted belt or renal truss, or by fixation of the kidney by operation. Hydronephrosis due to stone in the ureter, abnormalities of the ureter, growths of the bladder and prostate, and stricture of the urethra, must be treated by the removal of these conditions. (*See various articles on affections of the urinary system.*)

John George Pardoe.
(*Revised by Hugh Lett.*)

HYDROPHOBIA.—(*See* RABIES.)

HYDROTHERAPY.—This term may be used to cover all methods of using water externally for the treatment of disease, and will thus comprise the various forms of packs and douches as well as actual immersion.

While the resources of a fully-equipped bathing establishment are required for the proper administration of some of the most useful methods, there are many which are within the scope of the practitioner in whatever circumstances he may be placed. It is to the description of these that this article will mainly be devoted, the more elaborate methods receiving only such notice as will familiarize the practitioner with the principles involved and enable him to decide which cases may with advantage be sent to spas or bathing establishments.

BATHS.

Baths may either be full, for the whole body, or partial, for a limited area or for one or more limbs, the same principles applying, though higher temperatures and longer duration are permissible in the latter. Their effects may also be modified by the use of mechanical measures such as massage, douching, or simple agitation of the water by aeration or by chemical agents. Sonntag, as a result of observations made at the Red Cross Clinic in London and also at the hydrotherapy department of the Special Military Hospital at Shepherd's Bush, has laid down a useful code of rules for the prescribing of baths (*Lancet*, cxcvii, 669).

The Full Hot Bath has a range of temperature of from 98° to 106°, and its duration may be from five minutes or less to twenty minutes. At the higher temperatures, or if the bath is prolonged, it is wise to wrap a towel wrung out of cold water round the head to prevent faintness by setting up a reflex constriction of the cerebral capillaries, which would otherwise be depleted of blood by the general dilatation of the cutaneous vessels. Such baths are stimulating at first but later depressing, and their duration must be regulated by the effect it is wished to produce. The stimulating effect of a hot bath may be maintained or enhanced by cold affusions to the whole or part of the body at its conclusion, or by douches. It is then of great value for combating exhaustion or fatigue ; but if the exhaustion is extreme the affusions should be omitted, as the power of reaction will be in abeyance, and the bath should be brief and followed by rest in bed. As an antispasmodic in high blood-pressure from vascular spasm, and in spastic conditions of the muscles, hot baths of full duration at 100° to 102° without cold affusions and followed by rest will be found one of the most valuable remedies at our command, and similar treatment may be adopted with advantage for the promotion of elimination, for calming excitement, and for the relief of pain. Dysmenorrhœa may be similarly treated if due to spasm.

Local or Partial Hot Baths have a higher range of temperature and duration. Sonntag gives the following range : at 108° twenty minutes, at 112° eleven minutes, at 118° eight minutes. They are useful in the treatment of stiff joints and such painful conditions as sciatica and neuritis.

The hip- or sitz-bath is a well-known variety of local bath. The patient sits in the bath with the feet outside and the shoulders and legs protected from cold by clothing. The effect is anodyne and sedative, and the bath may be kept up for twenty minutes to an hour, fresh hot water being added from time to time to maintain the temperature at the desired level. They are useful in spasmodic conditions, tenesmus, retention of urine from congested stricture or urethral spasm, amenorrhœa, dysmenorrhœa, and ovarian neuralgia. The addition of mustard to the bath increases its derivative effect.

The hot foot-bath is a household remedy and requires no description. It is derivative in action and useful in incipient coryza, delayed menstruation, congestive headache, and some forms of insomnia.

Neutral Baths are at the temperature of the nerve-endings of the skin, and range from 92° to 97°. They produce a minimum effect on the cutaneous nerve-endings, and can be given for long periods. Full immersion at such temperatures protects from outside stimuli and is markedly sedative. Such baths have been found of great service in shell shock, traumatic neurasthenia, mental excitement, etc., and may advantageously be given in a darkened room to avoid light stimuli, as in the 'pool bath'. Their use in extensive burns is well known, and they are also effective in reducing temperature.

Tepid Baths have a range of temperature from 80° to 92°, and cool baths from 65° to 80°. They may be considered together, and are commonly given in combination with some form of friction or massage, as in the *Brand bath* for enteric fever, which requires fuller consideration, as its technique is of the utmost importance. It is applied as follows: A bath of sufficient length to hold the patient is filled with water from 90° to 65° to three-fourths of its depth; in acute cases it must be of a portable pattern and placed by the patient's bedside; in cases of great severity, or where conveniences are not available, a bath can be improvised with a rubber sheet and a light wooden frame and placed on a bedstead. A stimulant may advantageously be given before the bath. After the patient's clothes have been removed, his face is bathed in cold water and he is lowered into the bath with the greatest gentleness, some support being arranged for his head. Friction of the whole body is immediately commenced, and is kept up throughout the time of immersion; this is extremely important, and should in no circumstances be omitted. It prevents chilling and collapse, and causes redness of the skin, in contrast to the pallor at the moment of immersion, while by bringing a greater quantity of blood to the surface the antipyretic influence of the bath is enhanced. Shivering is not a contra-indication to the use of the bath unless accompanied by chattering of the teeth, nor is blueness of the skin unless affecting the face. The duration of the bath may be from five to twenty minutes, remembering that a short immersion in cooler water is more stimulating though less heat-reducing than a longer bath at a higher temperature. In enteric, as soon as a diagnosis is made, the baths should be started, beginning with about ten minutes' immersion, increasing, say, one or two minutes daily, and then decreasing again, but always being guided by the condition of the patient rather than by fixed rules as to temperature and duration. Where the diagnosis is in doubt, they may be begun if the temperature persistently marks 103°, the temperature of the bath starting at 90° and being reduced five degrees each time till 65° has been reached; so long as the temperature is 103° in the rectum the baths should be given three-hourly; as it falls the frequency may be diminished. During the bath, water from a basin at 50° to 60° may be poured at intervals over the patient's head; a towel round the forehead will prevent it from flowing over the face.

It is not possible to go fully into the arguments which have been put forward for and against the use of this bath in enteric and similar diseases. Those who wish for an exhaustive examination of the whole subject should refer to Baruch's work on Hydrotherapy, where they will find most detailed instructions as to the principles involved, and a full discussion of the arguments for and against the method. For the present, therefore, it will suffice to quote Osler's words: "In any large series of cases, the severe manifestations appear to be less common, . . . the beneficial action is not so much special and antipyretic, as general, tonic, and roborant. The typhoid picture is not so frequently seen, and we may have twenty or more cases under treatment without an instance of dry tongue or delirium among them". Osler gives the following statistics for the six years ending May, 1895: Cases admitted before the introduction of hydrotherapy 33, mortality 24·2 per cent; cases admitted since the introduction of hydrotherapy 356, mortality 6·6 per cent.

It must be clearly kept in mind that the object of the bath, while undoubtedly antifebrile, is primarily to stimulate and strengthen the vital organs, and thus to enable them to combat the toxins with success; and that *the use of friction throughout the bath is absolutely essential to its success*. In cases coming under treatment late, with their powers of reaction seriously impaired, it may be necessary to adopt milder measures as a preliminary, such as the Ziemssen bath or the half-warm bath with cold affusions; which latter I have found of particular value in scarlet fever with high temperatures, especially cases of the septic type, in which it has given excellent results.

The Graduated Bath devised by von Ziemssen is given as follows: The patient is prepared as in the previous case, and the bath is filled one-third full with water at about 90°; the patient having been placed in it, one attendant bathes him constantly with the water, using friction, while another adds water at 40° from a jug, avoiding contact with the patient's body, until the temperature of the bath is about 75°: water must be removed from the bath from time to time lest it become too full. The bath may be prolonged to half an hour, when the patient is removed without drying and placed in a warm woollen blanket.

The Nauheim Bath is an example of a tepid bath with the addition of chemical stimuli by means of the saline constituents, together with, in the stronger baths, mechanical stimuli obtained by effervescence. This bath has been used widely, and with success, in this country in the treatment of certain cardiac affections. The baths may be given at home, but rarely with success, since the essential rest and freedom from worries are seldom obtained, and to regulate the strength, duration, and number of the baths requires special experience. They are, however, given with success in most of the English spas.

Cold Baths are rarely used alone as therapeutic measures. Their range of temperature is from 65° downwards. In the form of plunge baths of a few seconds' duration they are strongly stimulating. They must be followed by friction to promote reaction, and may be used after hot baths to counteract any depressing effect. Cold baths too prolonged or unaccompanied by friction are depressing. It has been laid down as a cardinal rule never to apply cold to the whole body as a therapeutic measure unless the skin has been warmed up previously.

The Cold Foot Bath deserves mention as a remedy for insomnia which is often very effective and free from any risk; it is a remedy which also has the advantage of being usually at hand when most required. An ordinary bedroom basin is filled with sufficient cold water to just reach the ankles, the feet are immersed for twenty to thirty seconds, and then dried with friction with a rough towel. Sleep is often promptly induced.

The Contrast Bath is used for the chronic stage of trench-foot, for vasomotor paresis after prolonged splinting, for flat-foot, and for profuse perspiration. It consists in the alternate immersion of the part in hot and cold water. Sonntag recommends the following temperatures, etc.: hot application 116° for thirty seconds, cold at 40° to 50° for fifteen seconds. This is continued daily for fifteen minutes or as long as may be necessary.

The Whirlpool Bath is only available in special bathing establishments, but may be briefly described. In it the water is kept in a state of violent agitation, either by a constant stream of water or, in the modern form, by means of a turbine, sometimes combined with artificial effervescence by driving in compressed air. Thus to the thermic stimuli of the ordinary bath at the same temperature are added the effects of strong mechanical stimuli, which profoundly modify the general effect.

Douches are important weapons in the armamentarium of the hydrotherapist, but can be obtained only at spas and properly equipped bathing establishments, and therefore need not receive much attention here. The needle bath is well known; its action is refreshing and stimulating where muscular or nervous tone is impaired; it acts mainly through the massaging effect of the numerous jets of water, which should be at about 30-lb. pressure. The Scotch douche is a single jet more or less rapidly alternating between hot and cold, and with a pressure of 20 to 30 lb. It is most commonly applied to the spine, and is powerfully stimulating in its effect. The Aix douche is a combination of massage and douching; it is given by one or two attendants, who massage the whole body while a stream of water is playing upon it from the douche, which is given by a hose-pipe hanging over the operator's shoulder. Its modifications, the Vichy douche and the Buxton douche, are much the same in principle, but are generally preferred by patients. The effect of a douche is much deeper than massage given in any other way, and sets up a powerful vibration in the structures treated, which is of great value in chronic rheumatic affections.

Mineral Water Baths.—The action of mineral water baths, while dependent in some measure on the water, owes much to the saline or gaseous constituents, and as few can be imitated with any advantage at home, a full description would be out of place here.

Briefly, so far as their use in bathing is concerned, they may be divided into three classes : thermal, saline, and sulphur.

The thermal indifferent waters, such as Buxton, Bath, Gastein, etc., have for long been noted for their action in rheumatism and gout, for which no satisfactory explanation could be given, since they contain little dissolved mineral matter, though they are as a rule charged with gas which is, in the typical members of the group, nitrogen. Recent researches have, however, shown them to be radio-active in a marked degree, and experiments have proved that this explains their action in great measure. Probably it is not only the effect of the radium emanation on the body, but also that the other constituents are more potent in the presence of the emanations than would otherwise be the case. They produce a more marked reaction than ordinary water, and, when prolonged, a remarkable sense of lassitude and fatigue : a course has a decided effect in reducing blood-pressure where it is higher than normal. The use of the douche at the time of the bath is customary in the spas belonging to this group.

The sulphur waters, where sulphur is the chief constituent, are limited in their action as baths, beyond the action of plain water similarly administered, to influencing morbid conditions of the skin ; the higher the proportion of other ingredients, the more nearly they approach the action of the next group. Sulphur baths may be prepared at home for use in skin diseases by means of the proprietary preparation 'Sulphaqua'.

The saline waters have a distinctly irritative action on the skin and the cutaneous circulation. This is seen in a mild form in the effect of sea-water bathing, but as most of the waters in this group which are used for bathing are highly gaseous, their action in this respect is thus considerably increased. The Nauheim baths are perhaps the most potent.

Brine baths also are easily prepared, amd are useful in lumbago, sciatica, and chronic rheumatic conditions, as well as in chronic inflammatory disorders of the pelvic viscera. They are best prepared from the salts obtained from saline waters by evaporation ; Droitwich salt, among others, is placed on the market for this purpose. The bath should be at a temperature of 95° to 98°, and fifteen minutes to half an hour is the usual duration, after which the patient should be rapidly dried and removed to bed. Soda baths are prepared in the same way, common washing soda being used, and are useful more especially in chronic rheumatic conditions such as fibrositis. To a full bath 10 to 20 lb. of salt, or ½ to 2 lb. of common washing soda, may be used.

Other medicated baths are occasionally used, such as pine, tar, bran, etc. ; these do not require description.

Peat or 'moor' baths are in use at many spas in this country and on the Continent. They are prepared by the admixture of finely disintegrated peat with mineral water. At Marienbad, Buxton, etc., a ferruginous water is used, and this is the most frequent type, but sulphurous peat baths are also prepared, and at Buxton the radio-active water is often used. The action of these baths, owing to the heat and friction of the fine particles held in suspension, is to stimulate the nerves and blood-supply of the skin. They can be borne much hotter than water baths, since they retain their heat better, but the most useful range is from 95° to 105°. At the lower temperature they are sedative to a marked degree.

PACKS.

These are the simplest and easiest of application of all hydriatic methods, and moreover can be used with advantage in the most difficult circumstances. They may be general or local, according to the conditions to be treated. For convenience, the drip sheet will be included under this heading and may be described first. The temperature of the room in all wet-pack applications necessitating exposure of the body at any stage should be, if possible, about 70° to prevent chill and promote reaction, and it is best, wherever possible, to use linen cloths or sheets in preference to cotton ; if only cotton is available, the oldest possible should be used.

The Drip Sheet.—The patient stands in a shallow tub containing about a foot of water at 100°, and a sheet dipped in water at 75° (reduced daily by a degree or two until it reaches 60°) is wrapped round him in the following manner : The end is placed under the left arm and held in position by pressing the arm to the side ; it is carried across

the chest and under the right arm well up in the axilla (*Fig.* 38), round the back, over the left shoulder and arm, covering both (*Fig.* 39), and thence over the right shoulder and arm and as much further as it will go ; it is then tucked carefully in around the neck and legs (*Fig.* 40). A basin of water about ten degrees cooler than that used to wet the sheet is poured over the head and shoulders at short intervals, and rapid light friction, and slapping all over the body and limbs, are kept up by the attendant for five or ten minutes, according to the capacity of the patient. He is then uncovered and rapidly dried with warm towels, when he may dress and take light exercise. The duration of the bath must be judged by the patient's emerging with the skin decidedly hyperæmic, and feeling refreshed ; fatigue, if at all marked, is an indication that the pack has been too prolonged. The effects are : deepening of respiration, diminution of pulse-rate and temperature, and increased muscular capacity. It is of value in chlorosis, and anæmia, neurasthenia, melancholia, hypochondriasis, and some neuralgias ; in fact, in all cases where stimulating and invigorating procedures are required in patients whose health is not too feeble to ensure



Fig. 38.—Application of Drip Sheet, 1st position : sheet across chest and under the arms.

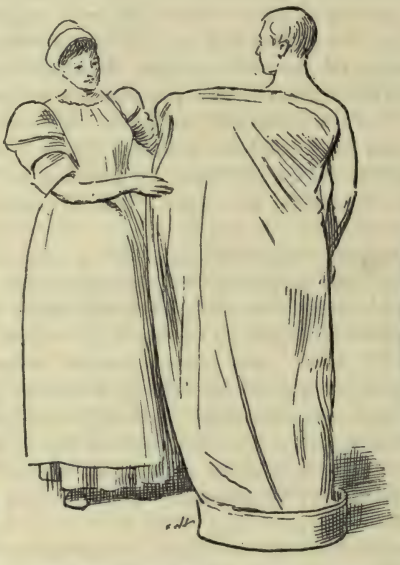


Fig. 39.—Drip Sheet, 2nd stage : sheet carried across the back and over the left arm.



Fig. 40.—Drip Sheet : patient completely enveloped and ready for rubbing, etc.

a sufficient reaction. Its duration may be anything from two to ten or fifteen minutes : the shorter duration for tonic and the longer for antipyretic effects, while modification in the temperature of the water and in the vigour of the friction may be made with advantage where indicated.

In more weakly patients the sheet bath may be used, especially as an antipyretic method. A rubber sheet or oilcloth is spread over a suitable bed or cot, and covered with a blanket. Upon this a sheet wrung out of water from 80° to 50°, as may be indicated, is laid, and the patient placed upon it with his arms above his head ; the left border of the sheet is brought over the body and should just reach to cover the right axilla, the lower portion being placed between the legs to separate them ; the arms are then brought down close to the sides, and the right border of the sheet is carried across the chest and tucked in on the left side ; the ends are carefully tucked in around the neck and feet. Friction is then carried out as in the drip sheet, with modifications suited to the strength of the patient, and as different parts of the body become warmed by the friction, water at a temperature of 50° to 60° is poured over them from a cup. The duration may be from two to ten minutes ; shivering, unaccompanied by chattering of the teeth, is not an indication for stopping unless it is prolonged. The patient may be covered with the blanket and the rubber sheet and left for half an hour if it is desired to enhance the antipyretic effect, or he may be rapidly uncovered, dried, and put back to bed.

The action of this procedure is antipyretic and soothing, and it may be used as a substitute for the cold bath in the reduction of temperature where the latter cannot conveniently be used or where the friends of the patients object to such measures. It is far more effective than sponging in reducing the temperature, and has a tonic instead of a depressing effect.

The Wet Pack is somewhat similar in its mode of application to the foregoing. The bed should be narrow, and placed in such a position that the attendant has easy access to all sides; the rubber sheet and blanket are arranged as before. A linen sheet is well wrung out of water at 70° or less, and spread upon the blanket; the patient is placed

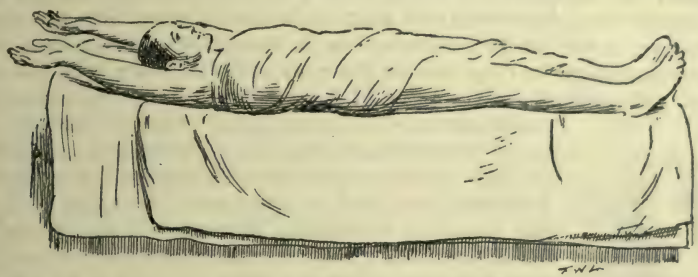


Fig. 41.—Wet Sheet Pack: sheet carried over from left to right under the arms and between the legs.

thereon so that the upper end of the sheet is level with the ears and the lower end extends for at least 18 inches beyond the feet (*Fig.* 41); it is then wrapped round him as closely as possible in the way described in the case of the sheet bath (*Fig.* 42); the blanket is drawn firmly round him from the left and tucked in on the right side of the body, and then from the right similarly; the upper border must be carefully secured round the neck and the lower end round the feet. Everything depends on the care taken to pack the blanket closely so that access of air is excluded. A wet cloth may with advantage be wrapped round the head. He may be covered with several woollen blankets if he feels at all chilly, and be left for from half an hour to an hour, the room being kept suitably warmed but well ventilated.



Fig. 42.—Wet Sheet Pack: sheet carried over from right to left; arms brought down to sides and covered, and sheet tucked in at neck and feet. The blanket will be wrapped over similarly.

Since no friction is used, the success of the pack will depend on the patient's own powers of reaction, and if successful the reaction will soon occur, and he will feel calmed and soothed and not infrequently will fall asleep, awaking refreshed. It is then desirable to stimulate the relaxed cutaneous circulation by means of a cool needle bath or douche, or, where these are unobtainable, by a brief immersion bath or sheet bath such as has been described. At the outset of the bath there is a slight shock which may be accompanied by shivering, and this may go on for five or ten minutes, or longer, until the temperature of the sheet is raised to that of the skin; if shivering is prolonged, the temperature of the sheet should be higher on the next occasion, or hot-water bottles may be sparingly used; when the patient becomes accustomed to the treatment, the temperature of subsequent packs may be lowered.

This application is valuable, especially in irritable conditions such as delirium and

mania, on account of its sedative effect. I have had most excellent results in neurasthenia and kindred conditions. It may be tried with advantage in some forms of sleeplessness, and has been recommended in rheumatism, gout, anæmia, and neuroses of digestion. If used as an antipyretic measure, the pack should be changed as soon as the blanket feels warm to the hand placed under the body. This is best done by having a second bed prepared in a similar manner, so that the change may be effected with as little delay as possible ; as many as four or five packs may be given if required to bring down the temperature to the desired level.

'**Local Packs.**'—These are applied on the same principles to whatever part it is desired to treat ; for example, the head, throat, thorax, abdomen, or joints. They are commonly termed wet compresses, and may be warm or cold, but the most generally useful temperature is 60° or 70°. From two to four layers of old linen are used, and cut to such size and shape as may best fit the part to be treated ; they are wrung out of water, applied, and covered with a piece of flannel large enough to extend beyond the compress in every direction in order to exclude air. This is much better than using oil silk or other impermeable material.



Fig. 43.—Throat compress properly applied.

The *throat compress* is very useful in pharyngitis, laryngitis, tonsillitis, etc., but it is necessary to apply it with care that the throat is sufficiently covered. It should be three or four inches wide for an adult, and the flannel bandage to cover and secure it may advantageously be applied as follows : Take a strip of flannel of sufficient length and width and slit the ends down towards the middle to within about six inches—the exact distance should be determined by measuring from ear to ear beneath the chin ; this is then applied with its middle over the compress, the lower tails are carried to the back of the neck, the upper ones pass over the ears to the top of the head ; they may be secured there or be carried round and brought under the chin again (*Fig.* 43)

The chest compress is of value in pneumonia, especially bronchopneumonia, and in phthisis ; it has a mild antipyretic action if it is frequently changed and the application is prolonged. The most useful temperature is 60° to 70°, but it may be used warmer if there is a tendency to insomnia or delirium, or cooler in stuporose conditions. The same principles hold in its application, and it is a good plan, having prepared the compress and cut it to fit the patient by hollowing out for the arms, to roll the ends to the middle and apply it by placing it beneath the back and unrolling thence to either side ; similarly with the flannel.

The abdominal compress, applied in the same way, has been used with good effects in enteric fever, peritonitis, and the enterocolitis of children. A modification, however, known as the Neptune girdle, requires description. It is usually worn for eight to ten hours without change, and may be continued for weeks or months. It consists of a bandage of coarse linen or swansdown wide enough to reach from the ensiform cartilage to the pubis, and long enough to go round the body and to cover the abdomen twice at least : it is moistened and applied in the same way as those already described, and covered with another linen or flannel bandage. The skin should be carefully washed each time the compress is changed. This application was used by the older hydropathists and worn for five or six weeks at a time ; after a week or two a pustular dermatitis usually occurred, termed a crisis, and it has been supposed that toxins were excreted in this way. It is very useful in chronic inflammatory conditions within the abdomen, especially chronic congestion of the liver of tropical origin. Applied at night it will frequently relieve insomnia.

Two sets of bandages should be used whenever they are to be continuously employed, and each should be boiled for fifteen minutes once a day ; the skin also must be washed carefully and frequently ; under these conditions the 'crisis' does not usually appear, but otherwise troublesome outbreaks of furunculosis are liable to occur.

Hot compresses are useful in the treatment of lumbago and sciatica. Cold precordial compresses have a tonic effect on the heart, and often relieve palpitation very effectively, but for the latter purpose an ice-bag is more convenient.

In all hydrotherapeutic measures, if successful results are to be obtained, the most careful attention to details is essential, but with such attention they will be found a most valuable addition to the resources of the practitioner. *Charles W. Buckley.*

HYDROTHORAX.—This name is given to the passive collection of serous fluid in the pleura, owing to cardiac failure, chronic renal disease, or the pressure of tumours on veins and lymphatics within the thorax. If the primary cause be cardiac or renal, attempts may be made to lead to the absorption of the fluid by: (1) Cardiac stimulants, (2) Purgatives, (3) Diuretics, and (4) Diaphoretics.

The value of the first of these methods is obvious, and in many cases, as the heart condition improves, the hydrothorax disappears and the fluid is absorbed. The drugs available and their method of use are described under CONGESTION.

The use of purgatives, diuretics, and diaphoretics, to disperse a pleural effusion, is based on the clinical fact that it is not very uncommon, in the natural resolution of disease, for a hydrothorax to disappear simultaneously with the onset of diarrhœa, or profuse sweating, or the passage of a large quantity of urine. But it by no means follows that if we artificially induce these conditions we can bring about absorption of pleural fluid. It is well recognized now that all three methods very often fail to produce the desired result, and only exhaust the patient further.

When hydrothorax is present on one or both sides, from cardiac or renal causes, the best course open to us is to aspirate, and draw the fluid off gently. This may be done by siphonage with Southey's tube, the indiarubber tubing being filled with water before the trocar is thrust into the pleura; or with an ordinary aspirator syringe or bottle.

In all cases where the fluid is due to the pressure of an intrathoracic growth, aspiration is the only method available. It is well not to forget, in cases of growth, that sudden death frequently follows the withdrawal of fluid; this happens even though the fluid has been removed slowly and with great care. The relatives should be warned of this before the performance of the operation. *Cecil Wall.*

HYPERCHLORHYDRIA.—By hyperchlorhydria is meant, for the purposes of this article, that form of dyspepsia met with especially in healthy young men and characterized by discomfort or moderate pain when the stomach is empty. Many such patients ultimately develop duodenal ulcer. Excess of hydrochloric acid in the stomach is also met with in various other conditions, e.g. 'appendix' dyspepsia, acid gastritis, in pregnancy, etc., and requires the same treatment.

Apart from general hygienic management common to all forms of functional dyspepsia (*see* DYSPEPSIA), hyperchlorhydria demands treatment by diet and antacids.

The principles of the dietetic treatment are: (1) To avoid everything which stimulates gastric secretion; and (2) To let those foods predominate in the diet which best 'fix' free hydrochloric acid, or which tend to restrain its production.

In accordance with these principles, salt, pepper, mustard, spices, pickles, condiments, and alcohol should be avoided. Fats and all animal foods should be taken freely, but starchy foods such as bread, puddings and potatoes should be restricted. Food should be taken at short intervals. A glass of warm milk, for instance, may be taken between breakfast and lunch, again instead of afternoon tea, and at bedtime. Tea is usually harmful, though China tea taken with plenty of milk or cream sometimes agrees. It is sometimes convenient for the patient to carry some plasmon biscuits, and to nibble one if he feels any discomfort.

The best antacids are the carbonates of bismuth, magnesia, and calcium, and a powder of 10 gr. of each of these with 10 of bicarbonate of soda may be taken between meals. It is often more convenient for the patient to carry an antacid lozenge, e.g. bismuth lozenges, absorbent lozenges, etc., and to suck one or two if he has any discomfort. The administration of belladonna or atropine is sometimes recommended in order to restrain the secretion of gastric juice, but its other disadvantages outweigh any benefit which it effects. On the other hand, the bromides are sometimes useful in nervous subjects.

The constipation which so often accompanies hyperchlorhydria must be managed on the usual lines. (*See also* DYSPEPSIA, ACID; DUODENAL ULCER; HEARTBURN.)

Robert Hutchison.

HYPERIDROSIS.—General sweating is a part of some general disease. The term hyperidrosis may be taken to apply specially to cases of localized sweating, particularly those of the hands and feet. One recognizes certain constitutional conditions predisposing to this, and these should always be kept in mind, and treated if present. Thus anæmia is a very common predisposing cause in girls ; alcoholism in men.

Drugs are not of much avail in directly stopping localized sweating, but a trial may be given to atropine, agaricin, and the like, while Crocker taught that sulphur is often useful, large doses of the drug being administered. Locally, frequent washing with antiseptic and astringent lotions should be systematically carried out, and Condy's fluid is a favourite application ; it is customary to advise the patient to change the socks daily and dust with some absorbent powder.

℞ Acidi Salicylici gr. x | Pulveris Talci ℥j

Such treatment may suffice in the mild cases, but in severe ones more active measures are required. Chromic acid is used in the French army, formalin in the Japanese, and the excessively heroic method of Neebe comes from Germany : this latter consists in the patient standing for a few seconds in crude nitric acid, sufficiently deep to cover only the soles of the feet. Such treatment is, in this country, reserved for a very small minority of the cases. Recently several cases of complete recovery have been reported (Howard Pirie and others) as the result of exposure to *x* rays. It is essential that this treatment should be carried out by an expert, as considerable doses are sometimes required. (*See also* PERSPIRATION, OFFENSIVE.)

Norman Walker

HYPERPIESIS.—(*See* ATHEROSCLEROSIS.)

HYPNOTISM, TREATMENT BY.

Methods of Inducing Hypnosis.—These have been classed as follows : (1) Physical (2) Psychical ; (3) Those of the magnetizers.

The modern hypnotist, however, whatever his theories may be, borrows his actual technique from Mesmer and Liébeault with equal impartiality, and in this way renders classification well-nigh impossible. Thus, the members of the Nancy school, while asserting that everything is due to suggestion, do not hesitate to use physical means. The passes with contact employed by Mesmer are almost exactly reproduced by Wetterstrand. Fixed gazing generally precedes or accompanies suggestion, and when these fail, Bernheim does not scruple to have recourse to narcotics.

As to physical methods, it is more than doubtful whether these have ever succeeded when mental influences have been carefully excluded and the subjects have been absolutely ignorant of the nature of the experiment. No one was ever hypnotized by looking at a revolving lark-mirror till Luys borrowed this lure from the birdcatchers and invested it with hypnotic power. On the other hand, any physical method will succeed with a susceptible subject who knows what is expected of him.

My own methods have varied widely. At first I attempted to induce hypnosis mainly by physical means, such as fixed gazing. Later, these were all abandoned, and I relied solely on suggestion. The following is now my usual method : I rarely attempt to induce hypnosis the first time I see a patient, but confine myself to making his acquaintance, hearing his own account of his case, and ascertaining his mental attitude with regard to hypnotism. I usually find, from the failure of other treatment, that the patient is more or less sceptical as to the chance of his being benefited. In most cases, also, he has either read misleading sensational articles on hypnotism, or his friends have painted its dangers in glowing colours. I endeavour to remove erroneous ideas, and refuse to attempt to induce hypnotism until the patient is satisfied of the safety and desirability of the experiment. I never tell a patient I am certain of being able to influence him, but always explain how much depends upon his own mental condition and power of carrying out my directions.

I further explain to the patient that presently I shall ask him to close his eyes, and then shall begin to make suggestions. I tell him that the important point is that he should concentrate his attention upon some drowsy mental picture, and try to turn it away from me and my suggestions ; the theory being that these are addressed to a secondary

consciousness. I then ask him to sit down in a comfortable arm-chair, and to close his eyes; as soon as he has done so, I commence to make suggestions of two kinds. The first are in reference to the condition I wish to induce while he is actually in the arm-chair. Thus, I suggest: "Each time you come to see me, you will find it easier to concentrate your attention upon something restful; you will become more and more drowsy and lethargic", etc., etc. The other suggestions are the curative ones, and these vary according to the nature of each individual case. I explain to the patient that I do not expect these suggestions to be responded to at once, though this does occur in rare instances, but that it is the repetition of the suggestion, made in this particular way, which brings about the result. Thus, from the very first treatment the patient is subjected to two distinct processes, the object of the one being to induce hypnosis, that of the other to cure or relieve disease; and frequently the latter is successful before the patient can be described as genuinely hypnotized.

The monotonous suggestions described above are not always necessary in order to induce hypnosis. In a recent case, where the patient was so deaf that I could make her hear only by shouting, I suggested to her in this way, i.e. by shouting to her beforehand, the condition of hypnosis which I wished to induce, and the curative results which were to follow from it. Shortly after closing her eyes, although I had ceased all suggestion, the patient passed into an undoubted hypnotic state, and this was speedily followed by marked improvement in the nervous symptoms from which she suffered.

In young children, I have frequently had good results by making suggestions during natural sleep. I place my hand on the child's forehead and quietly tell him that he is to hear my voice but still continue sleeping, at the same time making curative suggestions.

In cases where none of the usual symptoms of hypnosis are present, curative suggestions apparently differ little from those sometimes made in ordinary life by medical men and others. The results, however, are often very different. For example, a patient suffering from dipsomania had received many and varied suggestions. The loss of health, fortune, and friends were powerful suggestions to stop drinking. Twelve months passed voluntarily in a retreat ought also to have had a strong suggestive influence. They all failed, however; while treatment by suggestion, associated with hypnotic methods, was speedily followed by success, and the patient has now been an abstainer for many years. It is difficult to explain why suggestion, given in this particular way, should so frequently produce such striking results. Apparently the hypnotic methods, although often producing no true hypnosis, have increased the suggestibility of the patient. It is a mistake to describe such a condition as hypnosis, i.e., sleep. I frequently find, however, that curative suggestions are responded to as readily in this state as in profound hypnosis.

Self-Hypnosis and Self-Suggestion.—Putting aside the question of self-hypnosis amongst fakirs and other religious fanatics, I am not acquainted with many instances in which the primary hypnosis has been induced by the subject himself. Braid, however, stated that he hypnotized himself on more than one occasion, and successfully suggested the disappearance of rheumatic pain. Professor Forel, of Zurich, and Dr. Coste de Lagrave, have also succeeded in hypnotizing themselves, and the latter can influence himself in many ways by suggestion; he states he is able to get rid of pain, fatigue, mental depression, etc.

Shortly after commencing hypnotic work, I found that patients who had been deeply hypnotized could be instructed to reinduce the condition at will. Here suggestions during hypnosis were not necessary for the production of its phenomena; they were equally efficacious when made beforehand in the waking state. The subject was able to suggest to himself when hypnosis should appear and terminate, and also the phenomena which he wished to obtain during and after it. This training was at first a limited one; the patients, for example, were instructed how to get sleep at night or relief from pain. They did not, however, confine themselves to my suggestions, but originated other and widely varying ones regarding their health, comfort, and work. In several instances they made use of self-hypnosis for operative purposes, and astonished their dentists by remaining insensible to the pain of having their teeth extracted. In some cases, this power has been retained for over twelve years.

I have observed the phenomena of self-hypnosis in healthy persons also who have been hypnotized for experimental purposes. Here the subjects, when awake, could suggest to themselves that muscular rigidity, local and general analgesia, etc., should appear

during hypnosis, and then hypnotize themselves at will, when the phenomena duly appeared. During self-hypnosis the subjects were either *en rapport* with everyone or only with certain individuals, according to the suggestions they had made to themselves beforehand.

Even in slight hypnosis, and in conditions where it would be impossible to prove that the patient has been hypnotized at all, self-suggestion frequently gives striking results if the operator suggests to the patient during treatment that he shall acquire this power. For example, I published the following case, the notes of which were written by the patient, a professor of natural history at one of our universities, who had long suffered from insomnia. He had only three treatments, and during the second alone was he at all sleepy, and that very slightly. Not only did his insomnia disappear, but he acquired the power of putting himself to sleep at any time, and used it to escape the sea-sickness from which he always suffered when he crossed the Irish Channel. He lay down in his bunk as soon as he got into the boat, put himself to sleep by suggestion, and remained asleep until he arrived in port.

Method of Terminating Hypnosis.—The hypnotic state tends to terminate spontaneously. In slight hypnosis this usually happens as soon as the operator leaves the patient; in more profound stages it may not occur until after the lapse of several hours. The members of the Nancy school suggest during hypnosis that the subject shall awake at a given signal; as, for example, when the operator utters the word 'Awake', or counts 'One, two, three'. The nature of the signal is of little or no importance, the essential point being that the subject shall understand its import. The method just described is the one I usually adopt, and I have never experienced any difficulty in awaking my patients.

Susceptibility.—In April, 1892, Schrenck-Notzing published the results of his "First International Statistics of Susceptibility to Hypnosis". Fifteen observers in different countries furnished returns, which showed that they tried to hypnotize 8705 persons, with 519 failures, i.e., barely 6 per cent were uninfluenced.

Sex and *Nationality* appear to have little influence on susceptibility, but as a general rule the hysterical and ill-balanced are much more difficult to hypnotize than persons of intelligence and strong will. The insane are the most difficult of all to influence.

In reference to the methods of inducing hypnosis, susceptibility, etc., the principal points which ought to be kept in mind are: (1) That there is as yet no satisfactory explanation why hypnosis should be evoked by the methods employed; (2) That the varying susceptibility to hypnosis is equally difficult to understand. We do not yet know why identical methods should induce hypnosis in one instance, and have apparently no effect in another; (3) That it is equally difficult to explain why susceptibility to curative suggestions should obviously be developed in patients who have undergone hypnotic methods of treatment, but in whom hypnosis has not manifestly been evoked. If the patients have become drowsy during treatment, one might perhaps say, though one could not prove it, that the condition was one of slight hypnosis; but how is one to explain cases like the following? Miss ——, aged 19, June, 1900, a well-educated and highly intelligent girl, had suffered since July, 1895, from clonic muscular spasms, which first affected the left side only, then all the voluntary muscles. Later there were frequent attacks of violent generalized convulsions. She had continual medical treatment, and was finally admitted as a contributing patient to the National Hospital, Queen Square. After two months she was dismissed unrelieved, and sent to me. For the first fortnight she had violent convulsive attacks every time I treated her, but despite this I made suggestions in the usual way. In three weeks she was well, and is so at the present date.

THE THERAPEUTIC VALUE OF SUGGESTION.

Treatment by suggestion has yielded good results in every form of functional nervous disorder. In addition, the pain of organic disease can frequently be relieved in this way, and sleep procured without narcotics. The following list is simply an illustrative one, and in no way pretends to be complete:—

1. **Hysteria.**—(*a*) *Grande hystérie*, or hystero-epilepsy, and the conditions which sometimes persist after the convulsive attacks have disappeared, e.g., paralyses, contractures, spasms, anæsthesia, amauroses, etc.; (*b*) Monosymptomatic hysteria: monoplegia,

nutism, aphonia, hiccough, blepharospasm, dyschromatopsia, etc.; (*c*) The various manifestations of ordinary hysteria: dyspepsia, visceral and menstrual troubles, etc.; (*d*) Mental troubles of a hysterical nature: perversions of sentiment, obsessions, irresistible impulses, hallucinations, melancholia, maniacal excitement, amnesias, etc. In all these hysterical manifestations, the method may be employed directly to abolish the symptom, or indirectly as an instrument of investigating the subconscious. Most hysterical symptoms have their origin in some distressing event which is often forgotten, but which can be recovered by this method if simpler ones fail. (*See* HYSTERIA).

For example, a soldier complained of an hallucination of hearing, viz., that his own name was being called out loudly. He could not recognize the voice. He was afraid he was losing his reason. Under light hypnosis he quickly recognized the voice as that of his sergeant, who was calling on him to perform a certain duty which he refused to do. The sergeant was killed that day, and the patient, filled with remorse, endeavoured to suppress the incident; this he had nearly but not entirely accomplished, and the isolated memory, the voice, divorced from its associations, persisted as an hallucination. When the entire memory was restored, not only did the hallucination disappear, but it became easy to show the patient that his self-reproach was wholly unjustified.

For a purpose of this kind hypnosis must be light, as it is essential that the patient should recollect on awakening what occurred in the hypnotic state.

2. **Neurasthenia.**—In 1893–4 Schrenck-Notzing published an account of 228 neurasthenics treated by himself and others. The following were the therapeutic results: 72 cases, equalling 31·6 per cent, recovered; 84 cases, equalling 36·8 per cent, were much improved; 72 cases, equalling 31·6 per cent, showed no improvement.

In Schrenck-Notzing's opinion impotence of psychical origin is sometimes the only symptom of neurasthenia; out of 18 cases which he reported, 10 were cured by suggestion. I have seen several cases which tend to confirm this view. In the following one, if the patient suffered from neurasthenia, impotence was the only symptom of that disorder.

Mr. ——, age 35, healthy and athletic. Continent before marriage. No masturbation. The patient had been married over three years; he was completely impotent, and this condition had not been improved by medical treatment. Hypnotic treatment was begun on November 28, 1898, and continued for a month. Despite the fact that obvious hypnosis was not induced, curative suggestions were responded to. From Christmas, 1898, his sexual life has been that of a vigorous normal man. There has been no relapse, and he is now the father of three children.

3. **Insanity.**—In 1889, Voisin reported amongst others the following successful cases, of which he had traced the after-history: (*a*) Melancholia with hallucinations, treated in 1885; (*b*) Melancholia with hallucinations, suicidal ideas, and attempted suicide, treated in 1885; (*c*) Acute mania with convulsive attacks, treated in 1886; (*d*) Melancholia with refusal of food, treated in 1884; (*e*) Sub-acute mania, treated in 1885; (*f*) Sub-acute mania, treated in 1888; (*g*) Acute mania, treated in 1885; (*h*) Melancholia, treated in 1888; (*i*) Melancholia, treated in 1888. Cases (*h*) and (*i*) relapsed after attacks of epilepsy; the remaining seven continued well. Numerous other insanity cases, many of them equally interesting and successful, were reported by Voisin from time to time.

Dr. George Robertson, of Morningside Asylum, gives the following summary of the uses of hypnotism among the insane.

a. As a Direct Therapeutic Agent.—(i) Hypnotism sometimes succeeds in intractable cases of insomnia where narcotics have failed, and thus ought to be of great service where the brain nutrition is bad and depressing drugs are specially undesirable; (ii) When the brain is highly unstable it may be of direct therapeutic value as a sedative, and thus prevent an outburst of excitement from passing into mania; (iii) It is useful in dispelling fleeting delusional states and minor psychoses.

b. For Purposes of Management.—(i) Hypnotism may be used to overcome the morbid resistance of patients to the administration of food, medicine, etc.; (ii) It may be employed in cases of excitement and violence, instead of mechanical, chemical, or physical means of restraint.

4. **Dipsomania and Chronic Alcoholism.**—Nearly every medical man who practises hypnotism has reported successful cases of dipsomania and chronic alcoholism treated by suggestion, and some of my earlier ones have now remained over eighteen years without relapse.

5. **Morphinomania and other Drug Habits.**—Patients suffering from hysteria and

neurasthenia frequently acquire drug habits; the latter, however, are usually abandoned as soon as the insomnia and other morbid symptoms disappear under treatment. Still this is true of ordinary hypnotic drugs only, and does not apply to opium and morphia. The treatment of patients addicted to the latter, especially where the drug is administered subcutaneously, presents many difficulties, and relapses are frequent. As far as I know the best results have been obtained by Wetterstrand, of Stockholm: out of 41 cases he reported 30 as cured.

6. Vicious and Degenerate Children.—The following conclusions as to the value of hypnotism in the treatment of vicious and degenerate children were submitted by Bérillon to the International Congress of Hypnotism, Paris, 1889: (*a*) Many carefully observed facts prove the therapeutic value of suggestion in the following diseases of children: incontinence of urine and fæces, nervous twitchings, nocturnal terrors, onanism, blepharospasm, and other disturbances of the nervous system of a functional character. (*b*) So far no appreciable results have been obtained in cretinism, idiocy, or deaf-mutism. (*c*) Suggestion constitutes an excellent auxiliary in the education of vicious and degenerate children, especially where there are habits of lying, cruelty, inveterate idleness, or cowardice; (*d*) Suggestion should be confined to cases where the usual methods of education have failed, and medical men alone should employ it. It is not necessary to hypnotize normal children; ordinary training ought to be sufficient for them. When however, children are addicted to theft and other vicious and repulsive habits, and are afflicted with disgusting infirmities, we ought to try to cure them by hypnotism especially when their parents are in despair owing to the failure of all other forms of treatment.

These conclusions were adopted unanimously by the Congress, and were transmitted to the Minister of Public Instruction and the Minister of the Interior.

7. Obsessions.—Many successful cases have been reported by Schrenck-Notzing and others. Personally, I have found treatment by suggestion yield better results in cases of obsession than in any other form of nervous disorder. In many instances, unless the obsessions can be cured, it means that the patient must abandon his business or profession. In one extreme instance the patient had been forced to give up work thirty years before I saw him, but after a few months' treatment he recovered.

I do not for a moment pretend that one can cure everything and everybody by suggestion, and agree with Braid in thinking that he who talks of a universal remedy is either a knave or a fool. Hypnotism is simply an additional weapon by which medical men can combat disease, and many cases have been cured or relieved by it which had previously resisted long, careful, and varied medical treatment. Further, the diseases which frequently respond to hypnotic treatment are often those in which drugs are of little or no avail. For example, what medicine would one prescribe for a man who, in the midst of mental and physical health, had suddenly become the prey of an obsession?

In estimating hypnotic results it must not be forgotten, too, that the majority of cases treated in this way are extremely unfavourable ones. Since I came to London patients have rarely, if ever, been sent to me when they first fell ill, and with most of them every form of treatment had been tried and had failed before hypnotism was resorted to. As the value of treatment by suggestion and its freedom from danger become more fully recognized, it will doubtless be employed in earlier stages of disease, and when that day comes the results will be still more striking.

Above all else, it should be clearly understood that the object of all hypnotic treatment is the development of the patient's control of his own organism. Many illnesses represent the culminating point in a life which has been characterized by lack of discipline and self-control. While attention is given to physical culture, the emotional side is too often neglected; but much disease would be prevented if we could develop and control moral states just as an athlete does physical ones. One point is worthy of special notice. The results obtained by suggestion are due to the action of the patient's mind on his own body and are free from the disadvantages sometimes associated with the use of drugs. Thus the patient who is cured of insomnia by suggestion has really acquired the power of producing sleep at will, while he who obtains sleep by means of an ordinary narcotic has often added a drug habit to his original disease.

In this country those who practise hypnotism have to contend with greater difficulties than are met with at Nancy. There, as the result of Liébeault's thirty years' work, fear and prejudice have been almost entirely removed, while here they not only exist, but are widely spread. For this, disgusting music-hall exhibitions, largely mixed with imposture, are much to blame.

The so-called Dangers of Hypnotism.—As far as my experience goes, the employment of hypnotism by medical men acquainted with the subject is absolutely devoid of danger. Professor Forel asserted that neither he, nor any other member of the Nancy school, had seen a single instance in which mental or physical harm had been caused by hypnotism. It is true that statements to the contrary still sometimes appear in the medical journals. The writers, however, are obviously unacquainted with the subject, and do not bring forward a single fact in proof of their statements.

It is to be hoped that the day will soon come when prejudice will disappear, and when treatment by suggestion will be employed by every general practitioner. It is not the specialist, whose practice is confined to unfavourable cases, who is likely to get the best results. It is the one who can choose suitable cases from amongst his own patients—patients whose confidence he has already gained.

No treatment can produce results equal to those claimed by Christian Science, but those actually obtained by hypnotism and suggestion cannot be paralleled by any form of faith cure. Further, these results do not depend upon faith, superstition, or emotional conditions, and surely it would be better for medical men to treat suitable cases by suggestion, rather than allow them to fall into the hands of dangerous quacks.

J. Milne Bramwell.

HYPOPYON ULCER.—(*See* CORNEA, DISEASES OF.)

HYSTERIA.—The rational treatment of hysteria and of the allied condition neurasthenia must depend on their pathogeny; a few words on this are therefore a necessary precedent to the discussion of therapeutic measures.

Both states are now regarded as of psychological origin, as different forms of bodily reaction to mental stress. They differ from several points of view; but both show failure of adaptation to the difficulties of life. The hysterical reaction may be looked on as one where the patient responds *negatively*, so that there results paralysis, anæsthesia, mutism, aphonia, amnesia, or loss of consciousness with or without convulsions. The mental state is one of placid acquiescence in the condition; there is no distress about its presence. Although the patient is probably not conscious of it, or at least not clearly so, the symptoms have achieved one important end, viz., they have put him into a position where he is no longer likely to be called on to make an effort. Hence he is not very desirous of losing them; hence also it is extremely easy to add more symptoms; this is one explanation of his great suggestibility. The neurasthenic reaction, on the other hand, is a *positive* one, the result of a struggle against difficulty, and its symptoms are those associated with overaction in the first instance and with fatigue later. They are in the main those which, as Cannon and others have shown, are connected with adrenalin hypersecretion and overaction of the sympathetic system, viz., tremor, tachycardia, anorexia, dyspepsia, polyuria, odd sensations in the head, insomnia, and, finally, fatigue. These symptoms are very distressing to the patient; they interfere with the efforts he is making, and he longs to be rid of them. Because of their alarming nature he acquires many anxieties and fears—that he has serious heart disease, that he will have an apoplectic stroke, and, most important of all, that he will become insane. On account of the anorexia and dyspepsia, loss of weight and strength ensue, so that an organic condition of bodily weakness is sooner or later added to the functional state.

In both states the symptoms are but the prolongation of the ordinary emotional reactions which occur in everyday life, and in these we may again distinguish between the negative (hysterical) and the positive (neurasthenic) responses. The student who faints at his first operation escapes, by this extreme negative reaction, from a position which distresses him. He who struggles to remain may tremble, sweat, feel sick, and afterwards suffer from a headache and be very tired. Although the modes of reaction are so different, the preliminary stages of successful treatment for both are identical, and

it will be convenient to consider them together. In each the aim of the physician is to understand the patient, and to make him feel that he does understand him. He will to then be in a position to make the hysteric see that his mode of reaction is a bad one, and give the neurasthenic a lively hope that his troubles will disappear.

To accomplish this it is essential that the doctor should listen once at least to all that the patient has to tell him, and it is advisable that notes should be taken of what is said. When the patient has finished, he should be asked about those regions and systems of the body which he has omitted to mention. Care must be taken to inquire about mental functions also: especially about depression, the condition of the memory, power of concentration, fears and anxieties. This is a procedure which is often left out of set purpose. It is stated that if a nervous patient is asked if he has a cough, he will acquire one in a few days, and that the doctor has suggested the symptom. Certainly if the question were asked in an anxious tone, and if it were an isolated one, such an unfortunate event might follow; but if it comes merely as one in a series, and it is clear that the doctor is only making a routine fnquiry about all the bodily and mental functions, the patient will not be led to think that there is suspicion of any special disease, and no harm will follow. If the plan is not carried out, awkward things are apt to happen later on. It is disconcerting to find after weeks of treatment that a patient whose complaint was paralysis of the arm was really suffering from fear of cancer in the breast; that another whose complaint was insomnia was really suffering from fear of impotence. It will be no defence to inquire why the patients did not mention these things; they were shy and did not like to, or they thought that the doctor would have inquired about their fears had he considered them important.

The tale of symptoms being complete, the attempt should be made to fix the time of their onset. In the hysteric this may be seemingly easy: hysterical cases are often, though not always, monosymptomatic, and the hysterical manifestation may have come on with dramatic suddenness. In the neurasthenic, on the other hand, the symptoms are never single, and they have had a gradual growth; symptom has been added to symptom as the case progressed. The first manifestations will have been slight and may be forgotten, and at the first interview, though the patient may give a date, it will be found subsequently to be incorrect. In the hysteric, although the onset of what is obvious may be known, later inquiries will show that, for some time before, all was not well with the patient.

Questions should be asked about other illnesses, and the attempt made to ascertain something of the general attitude of the patient towards life both now and formerly. What are and what were his interests? Did he lead a normal life in childhood and adolescence? Did he play games, etc?

All this takes time, but time is essential; it is not necessary that everything should be accomplished at one sitting, though it is better that it should be. It does not take longer than the performance of even a minor surgical operation, and most doctors find time for that.

Next, the patient must be examined physically, and this should be thorough, not only for the purpose of excluding organic disease, but also that the patient may receive sufficient assurance on this point. It should be remembered that many of these patients are old hands at being examined, and that a doctor who makes a slovenly examination will be detected by them, and will not be believed when he tries to assure the patient that there is nothing wrong with the organs of the body. This examination should be made once for all; repeated examinations will convey to the patient's mind the idea that the doctor is not sure. What the patient is told is important. If the doctor is sure that there is no organic basis for the symptoms, the patient should be told so. If further evidence is required, such as is yielded by the sputum or cerebrospinal fluid, or by consultation with a specialist, the opinion is withheld till this is done. If the doctor is not sure, even after this, he should say so. No loss of confidence follows this. The patient is pleased with honesty, and will be willing to wait till the case has been watched for a longer time.

If there is no organic basis, the patient is told that his symptoms depend on a mental attitude; and an explanation of how the mind affects the body is given. It is shown that in everyday life mental events cause physical symptoms: that anxiety causes

headache, insomnia, anorexia; that fear is followed by tremor or dumbness ('struck dumb with terror'); that disgust produces vomiting, etc. The patient may say that he has none of these mental feelings; but if the history has been taken carefully it will be easy to show that his symptoms did begin or get worse at times of strain and anxiety.

If organic disease is discovered, the patient should be told what it is—he probably knows already. If it has any relation to the symptoms complained of, this should be admitted; if it has none, the reasons for such a view must be given with lucidity. In this matter of explanation two errors are often made: on the one hand, organic disease present is scouted; if the patient knows of its presence this will be followed by instant and complete loss of confidence; on the other hand, some abnormality which has no relation to the illness is given as its cause. Great harm ultimately results from attributing widespread or remote symptoms to nasal spurs, minute errors of refraction, displacements of the uterus, and the like. Needless to say, condemnation of the practice of making an utterly false diagnosis with the view of performing a sham operation cannot be too strong.

At this point the management of the hysteric and neurasthenic diverge, and the remainder of the discussion of the latter will be found under its proper heading (*see* NEURASTHENIA).

The special treatment of the hysteric is wholly psychological. There are two points to be kept in view: (1) *The removal of the gross hysterical manifestation*; (2) *The alteration of the hysterical tendency*. The first is the easier of accomplishment, and in uneducated or stupid patients may be the only one that can be achieved. There are three methods of approach: suggestion, explanation, psychological analysis. It is probable that in practice all three are combined, but they can be studied separately.

1. Suggestion may be direct or indirect. The two indirect methods of most value are the Weir-Mitchell system and electricity. The Weir-Mitchell method depends on isolation, over-feeding, rest in bed, and massage. It is a method which can be administered in various ways. By cutting the patient off from worries, by not over-feeding too much, by allowing books and other luxuries, an exceedingly pleasant month or two may be spent. Although such a process may be a useful adjuvant in the treatment of neurasthenia, in hysteria it is worse than useless. It was stated that the hysteric is not disturbed at the presence of his symptom, that in a way it furthered his ends; in the picturesque language of Adler it is 'a convenient arrangement.' The more, therefore, that the treatment by indirect suggestion resembles an inconvenient arrangement, the more probable will be its success. For these patients, then, the isolation must be complete, the rest in bed absolute, books and amusements are to be forbidden until definite improvement ensues; with such a course weariness and boredom displace the advantages obtained by the illness, and convalescence ensues. The suggestion that cure will follow the treatment is accepted.

If electricity be the method chosen, it should for similar reasons not be of too pleasant a character, and therefore it should be administered by the doctor himself and not handed over to a nurse. Both these methods may be used without explanation. The patient is simply promised cure if he undergoes the treatment. In the past they have often been successful, but they are not methods of choice, because they do not teach the patient how to avoid relapse.

Direct suggestion without explanation may be practised while the patient is in the hypnotic state (*see* HYPNOTISM). The patient is told that he can move, and that he will be able to do so on awakening. This method is frequently successful also, but is open to the same objections as the methods already described.

It is much better to combine explanation with suggestion. The simplest method of accomplishing this is to provide the patient with examples of the emotional reaction, and to say that, when he became dumb or paralyzed from emotion, it would not have persisted unless he had believed that he really had become dumb or paralyzed; that if he now makes an effort he will find that he will be able to talk or move. If the history has been taken in the way advised, and the confidence of the patient obtained, this simple procedure will very often succeed, for the patient will be in a state of mind which is ready to accept suggestions from a doctor who has shown so much interest. The cure may take only a few minutes or it may take an hour, and although it is not necessary that it should

be absolutely complete at one sitting, this sitting should not terminate till there has been very decided improvement.

If the doctor does not feel sufficient confidence in himself to adopt this method—and sufficient confidence is only obtained by practice—he may reinforce his suggestion by various devices. He may employ a battery, and show that the muscles do work; he may manipulate the limb, and show that the muscles do resist; he may put the limb in the position into which the paralyzed muscles would put it, and ask the patient to resist his efforts to undo that position. The patient will often succeed in doing this, and it then becomes easy to show that the muscles which he thought were paralyzed were not really so. If the loss of power is due to contracture, i.e., to overaction of muscles, he must be taught to relax: if a hand is closed, he must not be urged to open it violently, but to think of it quietly opening. In all these proceedings no doubt must be cast on the patient's *bona fides*. He did not know consciously that he had these powers.

Of these methods the best, but the most difficult, is that where the doctor talks and does not touch the patient. The beginner will find it easier to adopt some adjuvant such as electricity, and will find as he gets more confidence that he is gradually able to dispense with it. The reason why it is best that the patient should not be touched is because then he knows for certain that he cured himself, that the cause of his illness lay in himself, and that if he relapses he should be able to cure himself.

Better still than the combination of suggestion and explanation is that of suggestion, explanation, and psychological analysis. The object in view is to find the exact circumstances, psychical as well as physical, which were associated with the onset of the symptoms. This is a method which may absorb several sittings; in the great majority of cases it need not occupy more than six to ten, and these need not be on consecutive days. It is not necessary that the analysis should be exhaustive, nor as a rule need the special technique of Freud be employed. The exact circumstances may be remembered by the patient easily; often they have passed out of consciousness. In the former case the patient will probably not have associated the real cause with the persistence of the symptoms. Thus, a soldier may have paralysis of the legs which appeared immediately after an explosion. He may be quite aware that at the time he was in a state of terror, though he will at first probably stoutly deny this. He will attribute the continuing paralysis to the physical shock of the explosion; but if he can be induced to see that paralysis supervened because of that terror, and was kept in being because he was mistaken about its meaning, suggestion will soon cure it. If he is led to believe that all soldiers were terrified, he will cease to be ashamed that he was. Later he must be shown, but with infinite care and tact, that he can do better than submit to a reaction of this kind. When this last has been accomplished, much will have been done to alter the hysterical tendency. No attempt should be made to point out this moral part of the treatment till the symptom has begun to improve, and not even then till the doctor feels that he has gained sufficient influence for teaching of this kind to be tolerated.

The circumstances may have wholly disappeared from consciousness, and then they must be sought for. In all instances of hysterical convulsions and amnesic states this is the case. The attempt has already been made in the history to fix the date of the first attack. The patient is now invited to think further back and see whether there was nothing of the kind in earlier years. He is asked to picture to himself very clearly the environment in which he then lived, and when he has done this the recollection of some earlier attack may come back to him. The process is repeated until he says definitely that he is sure that there was no attack before. He should then concentrate on the surroundings of his life at the time of the attack, when the emotional cause will probably flash into his mind, and the whole mystery be cleared up. It will be found that subsequent attacks came on when something occurred which was associated with the original emotional cause, and which would have brought this cause into consciousness. This, however, was frustrated by the attack itself. The patient escaped the painful memory by having the convulsion or loss of memory. Thus one man who was having convulsive attacks, on being questioned about one of them, said at first that he was sitting doing nothing; he then admitted that he had been sitting gazing at the fire, and that while he was doing so the word 'fire' in its military meaning came into his mind. This was the last thing he remembered before he lost consciousness. He was persuaded to

go on, and told a story of firing in a bombing raid which was the occasion of his first convulsive attack. When his history was taken he had as a matter of fact omitted all mention of this first attack, and had given a much later one as the initial fit. The first one had been associated with fear, of which he had been greatly ashamed. When the whole question of the normality of fear was discussed with him, he no longer sought refuge in this way from memories of a distressing character.

In many cases it will be necessary to go back a long way before the original attack is reached—often to childhood ; if the search is made systematically year by year, it is surprising what will be brought back to memory by this simple method.

It must be pointed out that the object of bringing a lost memory up to the surface is not so much to make it conscious as to persuade the patient to look at the incident from a standpoint different from that from which he was regarding it when it was in consciousness last. There is almost no event which cannot be looked at in more than one way, and these patients had usually chosen the worst. The part of the physician is to point out the better, and when this has been done the associated ideas will no longer be followed by an attack.

If this simple method does not succeed in revealing any incidents of importance, recourse may be had to Hypnotism (q.v.), but it is not often necessary to do this, and hypnotism is not a procedure to be adopted lightly. Should it also have been tried and success not have followed, there remains Freudian psycho-analysis, for the methods of which see special article. It should be borne in mind, however, that this is a grave and serious undertaking ; one from which, if the doctor fails, much harm may be done to the patient, and great discredit accrue to himself. The beginner would be well advised to leave this method to specialists.

It must be repeated that this view of hysteria does not imply that the patient is a malingerer, or even that he could do better if he tried. The reasons whereby he cannot do this or that are never fully in consciousness. Any attempt to bring them brusquely into consciousness at too early a stage is foredoomed to failure. The attack must always be indirect, so that by careful review of his own history, by considering its various aspects, the patient is induced to see for himself that the illness rested in the past on a false foundation, and that another way of regarding his difficulties will in the future keep him well.

Lastly, after a hysteric has lost his disability, it is necessary for some time to see that he uses the restored faculty. It is common to find that after a paralyzed hand can be used perfectly, the patient does nothing with it till his next visit to the doctor. He must therefore be given a series of tasks which must be done daily. It is not enough to tell him in general terms to use his hand : details must be laid down. (*See also* Psychoneuroses.)

T. A. Ross.

ICHTHYOSIS.—Although there are many grades of this disease, it is probable that they are all essentially of the same nature, though the severer the form the less amenable is it to treatment.

The principle of treatment is to supply to the skin that grease in which it is deficient, and this can be done, firstly, by doing everything possible to promote the patient's health and to encourage him to eat those things which tend to fat. Among these the leguminous vegetables are especially efficacious. Secondly, by a daily bath followed by the inunction of one or other kind of grease ; perhaps lanolin is best of all. But in this, as in so many other directions, the skin shows marked idiosyncrasies, and experiments should be made with a number to discover which best suits the individual case. Lard, vaseline, eucerin, sesame, olive, and linseed oils are all worth trying. A young lady patient of mine found after a series of experiments that goose-grease gave her most relief. Unfortunately she had to give it up, as she found herself followed by all the dogs in the neighbourhood. Grease well applied from the outside, by lubricating the skin, diminishes the discomfort associated with its excessive dryness. Thirdly, the internal administration of thyroidin in carefully regulated doses, or small doses of nitroglycerin, is followed by increased suppleness in the cuticle. Although arsenic is not generally indicated in ichthyosis, there are cases where it seems to be more useful than any other tonic in fattening the patient. It is most important in the management of a case of ichthyosis to make it clear to the patient from the outset that it is only amelioration and comfort, not *cure*, which one is able to promise him.

Norman Walker.

IDIOCY.—(*See* MENTAL DEFICIENCY.)

IDIOPATHIC DILATATION OF THE COLON.—(*See* CONGENITAL DILATATION OF THE COLON.)

IMBECILITY.—(*See* MENTAL DEFICIENCY.)

IMMUNIZATION.—(*See* SPECIFIC THERAPY.)

IMPETIGO CONTAGIOSA.—Few diseases are more amenable to suitable, or more rebellious to unsuitable, treatment than this very common disease. If the crusts are removed (either by starch poulticing or by oil soaks) and a weak antiseptic ointment (hydrarg. ammoniat. 5 gr., vaseline 1 oz.) constantly applied, even very extensive cases recover within a week or ten days. The secret of success is the thorough removal of the crusts, and the constant application of a *weak* antiseptic. In some cases a paste (hydrarg. ammoniat. 5 gr., zinc oxide, vaseline, ½ oz. of each) is preferable to a simple ointment. It seems unnecessary to resort to vaccines in a disease which is so certainly cured by simple local measures. The frequent association of pediculosis capitis with this disease should be kept in mind. *Norman Walker*

IMPOTENCE.—Impotence, or the inability to perform the normal act of coitus, may be due to various causes, which may thus be tabulated.

1. **Organic Impotence.**—This form may be due to malformation of the genital organs, e.g., the large or rudimentary size of the penis; extreme degrees of hypospadias or epispadias; congenital curvature of the penis and shortness of the frænum; phimosis; gouty or gummatous deposits in the corpora cavernosa, causing curvature of the penis; large scrotal herniæ, vaginal hydrocele, and elephantiasis scroti; cryptorchism, and bilateral atrophy of the testes from syphilis, gonorrhœal epididymitis, or orchitis consecutive to mumps. Some of these conditions admit of relief by the employment of ordinary surgical measures, but when the development of the testes is at fault, or when their functional activity has been abrogated by disease, no treatment is of avail.

2. **Symptomatic Impotence.**—Here the condition may be due to injury, disease, or the habitual use of certain drugs; it may be present in cases of phthisis, Bright's disease, and diabetes, and in such cases the treatment of the cause may be productive of some benefit. Some cranial and spinal injuries, accompanied by cerebral or spinal concussion, give rise to impotence, in some instances temporary, in others of permanent duration. The prolonged administration of depressing drugs such as iodide or bromide of potassium, opium, morphia, or salicylic acid, lead-poisoning, or the abuse of alcohol or tobacco, may be responsible for this variety of impotence, which is usually susceptible of improvement by the removal of the cause and the administration of tonics.

3. **Nervous or Psychical Impotence** may be due to any of the varieties of sexual excess, and consequent exhaustion of the functional activity of the genital centre of the spinal cord; it may be caused by mental overwork and trouble, by a too strenuous business life, or by prolonged abstention from sexual exercise. These cases of nervous impotence are in many instances associated with varicocele, chronic prostatitis, and prostatorrhœa. Cases of this nature are amongst the most difficult and trying that the practitioner may be called upon to treat, for this form of impotence is attended by an extraordinary degree of hypochondriasis, a condition which has been denominated sexual neurasthenia.

The treatment of this form of impotence will vary according to the cause, but must be primarily based upon the ordinary principles of sexual hygiene; these will include a cold morning bath, with cold douching of the perineum and scrotum; where cold is not productive of a healthy reaction, electric-light baths may be tried; a nourishing but not generous diet; stimulants only in very small quantities; active and well-regulated exercise; a hard bed with not too heavy coverings; careful regulation of the bowels; and galvanism or faradism of the perineal muscles. If chronic prostatitis or prostatorrhœa be present, the passage of a large silver sound, and the application of 20 min. of a solution of nitrate of silver, 10 to 30 gr. to the ounce, to the prostatic portion of the urethra by means of a Guyon's syringe, may be carried out twice a week. In cases in which impotence is caused by premature seminal emission, the above measures may be adopted, and at the

ame time abstinence from any attempt at sexual intercourse should be rigidly enforced. n a large number of cases of this nature the spinal genital centre is in an irritable condi- ion, which may be improved by sedatives such as bromide of potassium, hyoscyamus, onium, camphor, and the liquid extract of salix nigra. Where the genital centre is nactive from prolonged disuse or from the excessive use or abuse of the sexual organs, phrodisiacs may be resorted to. These drugs are mostly of the nature of nerve tonics, nd act indirectly upon the sexual organs ; amongst them may be mentioned phosphorus, ither in pills or in the form of hypophosphites or glycerophosphates ; extract of nux omica ; extract of damiana 2 gr. ; hydrochloride of yohimbine $\frac{1}{10}$ gr. ; muiracithin pills omposed of extract of muira-puama wood and lecithin, four pills to be taken daily ; the o-called 'pil. potentin co.' consisting of muira-puama extract and ovolecithin 1 gr. of each, hree to six daily being the dose ; a pill composed of :—

℞	Extracti Damianæ	gr. ij	Extracti Nucis Vomicæ	gr. $\frac{1}{4}$
	Lecithini	gr. j	Yohimbinæ Hydrochloridi	gr. $\frac{1}{10}$

Ft. pil., t.d.s.

r testicular extracts, such as orchidin, spermin, or liquor testicularis, administered either y the mouth or subcutaneously. Cantharides was formerly held in some repute as an phrodisiac, but is now for the most part discredited ; it acts locally by irritating the nucous membrane of the genito-urinary tract, causing an influx of blood thereto, and rection of the penis ; but if given in any quantity or for any length of time, it will pro- uce strangury, cystitis, and hæmaturia. (*See also* HYPNOTISM (**Neurasthenia**) *and* STERILITY.)

J. Ernest Lane.

INCONTINENCE OF URINE.—(*See* ENURESIS.)

INDIGESTION, INTESTINAL.—(*See* COLIC ; DIARRHŒA ; FLATULENCE.)

INFANT FEEDING.

BREAST FEEDING.

The chief factor in producing and maintaining a good supply of breast milk is he presence of the physiological stimulus to secretion—viz., an infant which sucks trongly and empties the breasts thoroughly. Every woman secretes some milk after lelivery, and although we know of no special regimen during pregnancy which will nsure lactation, a great deal can be done by care of the nipples to obviate one of the ommonest hindrances to the baby taking the breast well. The nipples should be gently nanipulated if they are depressed ; they should be scrupulously cleansed, and kept soft y the application of a little lanolin, which is better than a hardening spirit lotion. The ainful cracks which are so common early in lactation are best prevented by cleanliness nd the application of lanolin. They are difficult to cure when once they have developed. An old-fashioned but effective remedy is to wear in the intervals of nursing thimble-like ipple shields made of thin sheet lead. These act mechanically by giving the cracked ipple rest, they keep the parts soft and moist, and prevent crusting. The difficulties in aking the breast which depend on the infant—such as feebleness, prematurity, cleft alate, nasal obstruction, or dyspnœa from any cause—can seldom be directly overcome. Usually all that can be done is to persevere steadily in applying the child to the breast ntil it is really certain that he cannot or will not suck. If the child only empties the reast partially, the milk that remains behind should be taken off with a breast-pump.

The infant should be put to the breast about twenty-four hours after delivery, and t three-hourly intervals thereafter until the secretion is established. Two-hourly feed- ngs are bad. Each nursing ought to last until the infant is satisfied—usually about wenty minutes—and he should not be allowed to go on playing with the nipple after the reast is empty. If the breast yields little milk, some sweetened water must be given to he baby during the first few days to supply the needful fluid. No rule can be laid down s to how long it is safe to persevere in attempts to suckle. A week is perhaps an average, ut all depends on the strength of the infant. It is especially important at this time to onserve its strength by keeping it warm.

When once lactation is established the chief thing is to feed at long intervals—five

times in the twenty-four hours. Breast milk does not disagree with an infant; too frequent feeding often does, and attention to this is the best way of treating the dyspepsia of breast-fed infants. The only real evidence that a baby is not getting enough from the breast is failure to gain in weight. If the mother is leading a reasonably healthy life and taking enough ordinary food with some extra fluid (usually milk), little can be done to improve matters. Neither is it any use, as a rule, to attempt by changes in the mother's food to modify her milk so as to correct dyspeptic symptoms in the baby. Analyses of specimens of breast milk are of little or no value from the practical standpoint. Vomiting in breast-fed children is usually due to overfilling of the stomach, not to indigestion; if it is severe and persistent it should arouse the suspicion of congenital hypertrophy of the pylorus.

Weaning should take place about the eighth or ninth month. It ought to be gradual, the infant being fed as described in the section on artificial feeding. Mixed feeding is required earlier when the milk is insufficient, as shown by the infant ceasing to gain weight. One or more nursings are replaced by artificial feeds. In practice it generally happens that the partial withdrawal of the stimulus of sucking lessens the already inadequate secretion, and soon the infant has to be taken from the breast altogether.

The chief maternal contra-indications to nursing are tuberculosis, malignant disease, kidney disease, and, generally speaking, any serious organic malady. Febrile diseases of short duration need not involve more than temporary cessation of lactation. Menstruation is no bar to nursing, but pregnancy is. It may be necessary sometimes to remove an infant from the mother's breast for a time, e.g., on admission to a hospital. Many mothers can suckle the child again, even after it has been entirely off the breast for a week or a fortnight, but it is advisable to arrange for at least one nursing in the day in order to keep up the secretion. One respect in which breast-feeding appears sometimes to be inadequate is in the causation of simple anæmia of breast-fed babies. Human milk contains little iron, and some infants seem to be born with too little iron in their tissues, and become profoundly anæmic if breast-fed. These cases are rare, and respond quickly to small doses of iron.

Contrary to the general belief, drugs given to the mother in medicinal doses do not pass over in the milk in sufficient quantity to affect the infant in any way.

The common practice of 'cleansing' an infant's mouth by swabbing with boric lotion, etc., after each feed, does more harm than good, and is undesirable either in breast- or bottle-fed children, so long as the mouth remains healthy.

ARTIFICIAL FEEDING.

When an infant has to be reared by hand, cow's milk, and not one of the many substitute foods, should be chosen. The milk should be boiled or scalded, so as to render it approximately sterile before use. The nutritive value of the milk is not thereby impaired, and although its antiscorbutic properties are diminished, there is, in practice, no reason to fear that an infant fed on milk thus sterilized will develop scurvy. The object of heating is to destroy bacteria, and in particular the tubercle bacillus, which occurs in a sufficient proportion of samples of milk to constitute a real danger. Infants fed on raw milk run a grave risk of infection with tuberculosis, which, during the earlier months of life, is a very serious matter indeed; the resistance is poor, and usually the disease is rapidly fatal. In comparison with the destruction of tubercle bacilli, the other results of sterilizing milk are of little moment. Except for a rather small group of diarrhœal diseases, it does not appear that many cases of serious digestive disturbance in infancy can be rightly attributed to bacterial influence. Dirty bottles, sour milk, and general lack of cleanliness are, of course, factors which contribute to dyspepsia and consequent malnutrition. They are obvious faults, easily remedied, on which it is not necessary to dwell, but the best general hygiene and the most rigorous attention to the sterility of the milk are not in themselves enough to overcome all the risks of hand feeding, or to render it as easy as breast feeding.

We do not know, exactly, why it is that cow's milk is so much more apt to disagree with an infant than breast milk. The most striking difference between the two is the much larger proportion of casein in the former. No doubt the very dense curds which may form in the stomach when cow's milk is given can act mechanically and cause pain

nd vomiting, but there is no proof that beyond this the high casein content is detrimental. Neither can we say that the slighter differences in the fat and sugar content of cow's milk re responsible for its comparative failure as a substitute food. That these differences re inadequate as an explanation is shown by the very slight gain which results from the nore elaborate plans for modifying the composition of cow's milk so as to approximate s composition to that of human milk; such, therefore, may be discarded in favour of ne simplest methods.

It is probable that the real fault in cow's milk is due to its inorganic constituents. The solution of salts of which its whey consists seems to be an unsuitable medium for the ctivity of the infant's digestive glands, and this may involve incapacity to deal with fat r sugar, or both. Most likely the casein digestion is little, if at all, affected. There is round for believing that the resulting failure to digest the fats gives rise to the group of asting disorders, while the failure to digest sugar gives rise to the group of dyspeptic isturbances—vomiting and diarrhœa.

What is, perhaps, as important as the composition of the cow's milk, is the constitution of the infant to whom it is fed, and this factor is not always recognized explicitly nough. Everyone has had the experience of seeing an infant thrive and grow fat nd rosy on an apparently ill-chosen food which in most cases would spell dismal failure, nd we are equally familiar with the baby who barely struggles along on the most carefully adjusted diet. These cases are, of course, the extremes, but we must recognize that here is, among otherwise healthy infants, a considerable variation in the tolerance of milk. The further point to be grasped in this connection is a key to overcoming many of he difficulties in hand feeding, and it is this: that if the food be kept within the limits of he infant's tolerance, his digestive powers will gradually improve and his tolerance will ncrease. If, on the other hand, the food presented be beyond his tolerance, his digestive powers will not develop, and his tolerance, poor to start with, will become progressively ess, and in the worst cases will so diminish that his power of digestion is practically nil, s is seen in the graver forms of marasmus, which are to all intents and purposes incurable.

If one looks at the problem of artificial feeding from this point of view the whole natter is simplified, and with a moderate amount of care the failures should be few. The irst matter to be settled is the amount of milk to be given. If the infant gets too little, e will not grow; if he gets too much, he will very probably suffer from milk intolerance, he earlier symptoms of which will be referred to later. It will be found the simplest plan o work out the quantity which is required in the twenty-four hours, for if this is about ght it is largely immaterial how, and in what dilution, the amount is distributed through he day. It has been found as the result of observations on the weight curves of healthy nfants that up to the age of three months there is needed on an average about one-seventh f the body weight of milk daily. While this is generally a useful rule in practice, it must e remembered that the ratio of food requirement to body weight is not constant, but iminishes as the infant grows, being about one-eighth at the fourth, and one-ninth at he seventh or eighth month, provided that the infant is up to the normal standard of eight.

Starting on this basis, therefore, we may proceed to outline the diet of a hypothetical ormal infant weighing about 7 lb. at birth.

It is not usually advisable to begin with the whole 16 oz. which is theoretically ermissible. Rather do we start on 10 oz., diluted with 5 or 10 oz. of water, and it is ustomary, though not essential, to add sugar in the proportion of about 3 per cent—one-hird of an ounce of cane or milk sugar. The mixture should at first be divided into ten qual feeds, given at two-hourly periods, so as to leave one long night interval. (It is a ood rule that, irrespective of the food selected, there should be either ten 2-hourly, eight 2½-hourly, or six 3-hourly feedings. If these numbers and periods are adhered to, then ne long night interval is secured. Moreover, the old plan of regulating the size of the eeds by the supposed capacity of the infant's stomach—one ounce for every month of ge—need not be slavishly followed, for we know that the part of the food first swallowed as passed out of the stomach before the meal is ended.) As a rule, by the tenth or four-eenth day the quantity of milk can be increased to the full one-seventh, and thereafter e are guided by the weight, which ought to increase at the rate of 4 to 6 oz. a week. As he child grows older the dilution should be less, and by the end of the third month pure

milk may be given, when the added sugar should be reduced or omitted altogether. The periodical increases of milk need not be large. Thus, let us suppose that at the end of a month the infant weighs 8 lb. on 16 oz. of milk, and that in the ensuing week he gains only 2 oz., all that is needed is to bring the daily ration up to 19 oz., which might be given as ten 2½-oz. feeds, the mixture consisting of 19 oz. milk and 6 oz. water, or as six 4-oz. feeds (19 and 5). By the end of the third month a thriving infant may weigh 11 or 12 lb., and will take from 22 to 24 oz. of milk daily. As a general rule it is not necessary to give more than 32 to 35 oz. at any period of infancy; but it is impossible to lay down any quite hard-and-fast rule, and in some cases, during the later months of infancy, a baby will take 2 quarts of milk daily—the maximum allowable—with apparent benefit. Still, it is probably better to restrict the amount to 35 oz., and then to begin to add a cereal food, which may commence during the seventh month, especially if one or two teeth have erupted. The most convenient plan is to add to one or two feeds a tablespoonful of oatflour gruel, and, if this agrees, to give it with every bottle. At the tenth month it is advisable to replace first one, then two, bottles by a small saucerful of gruel, and at the same time to accustom the child to drinking from a cup or spoon. When this stage is reached, the period of infancy, so far as diet is concerned, is over, and consideration of the later feeding of the child may be deferred for the moment.

As has been said, it is desirable to establish the above ratio between the frequency and number of the feeds. It is advisable to keep the intervals long, and therefore the infant ought as early as possible to receive only six, or even five, feeds in the twenty-four hours. All this is purely a matter of training, and can often be attained by the second month.

It will be observed that in the above scheme the milk is given much less diluted than is often advised, but this is no drawback. It is well, however, to have the milk kept at the boiling-point for five or ten minutes, as this materially lessens curd formation; others have found that the same end—the use of strong milk mixtures—can be attained by using sodium citrate (1 gr. to 1 oz.) to prevent dense curds. If a Soxhlet or similar pattern of sterilizer is used and the milk heated to 212° for 45 minutes, curd formation is diminished to such an extent that it is not necessary to dilute the milk at all even for infants a week old. The use of undiluted sterilized milk, without added sugar, according to the method advocated by Budin, is generally most successful if properly carried out, the essential points being: (1) Restrict the daily quotum to one-seventh of the body weight, and be guided as to increases by the weight curve. (2) Begin by sterilizing for the full forty-five minutes and reduce the time gradually, until by the sixth month the milk is only being boiled for five minutes.

Without encroaching on the subject of treatment of the digestive disorders of infancy it is necessary here to enumerate the earlier signs of milk intolerance, which are very often unrecognized, and still more often misinterpreted and wrongly treated. The first sign is that the baby becomes 'soft', it loses a little of its healthy colour, it becomes fretful, its weight ceases to rise, and the motions become constipated, pale-yellowish grey, dry and crumbly. At this stage the disturbance is eminently curable by suitable alteration of the diet. Very often the doctor is not called in because the symptoms are trifling, and to the mind of the mother or nurse, not unnaturally seem to show that too little milk is being given. The child has been putting on weight well, now it is falling off a little; it was firm and rosy, now it is soft and pale; its bowels are costive; the obvious, but wrong, course is to increase the milk and probably add some cream. If this is done, the condition becomes worse: much more fortunate is the baby if the nurse changes the diet altogether, and gives a proprietary food. What is required if such symptoms develop in a milk-fed baby is at once to lessen the amount of milk taken, and to add carbohydrate. This can be done in various ways. The readiest is to cut down the milk by a third or a half, making up the bottles to the same bulk with water, and adding one to two teaspoonfuls of a malted food, such as Mellin, to each bottle. Much the same result is attained by putting the infant on some such food as Allenbury. The result of the change in diet is usually very successful. The symptoms disappear, the weight again rises, and the child recovers rapidly. It is not, however, advisable to return completely to the milk diet which has caused the trouble; the baby should continue to receive more starch and less milk than an ordinary infant.

Of all the diluents in use, water is the best. No advantage is gained by substituting barley-water, lime-water, and the like. It is unnecessary in ordinary cases to add alkalis. The addition of sodium citrate has been referred to.

When the infant has been fed exclusively on milk as described, it is not essential, though it does no harm, to give fruit-juice to counteract the deficit in antiscorbutic substances. If, however, it has been necessary to reduce the milk and feed the child partly on a starchy food, one or two teaspoonfuls of orange- or grape-juice should be given daily from the fourth or fifth month. The tendency to scorbutus is very much greater on a diet of sterilized milk plus starch, than on one of sterilized milk only. From the tenth month to the end of the first year the diet should consist of milk, farinaceous food, meat broths, and occasionally a little egg and bread-crumb.

In recent years a great deal of stress has been laid on the relation of a child's diet to dental disease, and it seems reasonable to believe that a too soft, pappy diet will hinder the development of the jaws and teeth, and favour caries. It is therefore advisable to encourage infants from the twelfth month or so to gnaw hard substances, such as buttered crusts, chicken bones, etc. Unfortunately, it is not always so easy as it would seem to induce them to acquire the habit. Apart from this, however, it is important to give a fair quantity of animal food during the second year, and not to restrict the diet to milk and milk puddings on the assumption that these are 'light' foods suited to an infant's digestion. From the twelfth to the fifteenth month an infant ought to have eggs, fish, gravy, and bread-and-butter in moderation; from the sixteenth to the eighteenth he may have tender mutton, veal, chicken, rabbit, or minced beef, and a little vegetable (cauliflower, marrow, carrot, Brussels sprout), and during the second half of the second year raw fruit may be added, for by this time, provided that he has a healthy digestion, his diet should differ little in its main constituents from that of an adult. Sugar and sweets, particularly the latter, should be given in great moderation. The best sweets are those which have been thoroughly boiled, such as toffee; chocolates, especially the more expensive brands, are probably the worst, because the sugar is so finely divided that it collects in the interstices of the teeth and ferments readily. Sweets ought never to be given the last thing at night; on the other hand, fruit given at this time cleanses the teeth and promotes a flow of alkaline saliva.

In conclusion, reference may be made to some of the more common substitute foods and the circumstances in which they are useful.

Peptonized milk is best made with peptogenic milk powder according to the makers' directions, but without the additional cream recommended. It is probably the most generally useful food for young infants who have difficulty with diluted or whole milk. It is, as a rule, less suitable after the third month.

Cream.—Since milk intolerance usually shows itself in relation to the milk fats, it is undesirable to add cream to the infant's diet. Quite enough fat is supplied in ordinary milk of fair quality.

Dried Milk, and *Unsweetened Condensed Milk.*—The only advantages of these are their cleanliness, and the fact that they do not form dense curds, and appear to be more easily digested on that account. They are much more likely than boiled milk to cause scurvy, and when they are used fruit-juice should also be given. Their chief application is in circumstances where reasonably clean fresh milk is difficult to obtain, as in the tropics, or in dispensary work in large towns, especially in hot weather.

Milk Foods with added Carbohydrate.—Under this head are included those which contain sugar (condensed milk) as well as those which contain malted starches. Sweetened condensed milks should not be used if dried or unsweetened milk is available. The milk-plus-malted-starch group are often useful in the first stage of milk intolerance (*vide supra*).

Skimmed or Separated Milk.—This is useful in cases of milk intolerance; during the early stage a malted food may be added; if there is vomiting or diarrhœa, skimmed milk may be used alone. It is, of course, an inadequate food, and can only be used alone for a limited period as a temporary measure.

Lactalbumin, sold in powder form under various trade names, has been used as an addition to diluted milk with the idea of approximating the protein content to that of human milk. From what has been said above, there seems little use in attempting this, and in practice the addition of lactalbumin is rather apt to cause vomiting.

Whey appears to have no advantage over skimmed milk, and is of less nutritive value.

Asses' milk is expensive and difficult to obtain; it cannot be boiled without loss on account of the large amount of soluble albumin present, which is, of course, precipitated by heat. It is therefore difficult to keep it sweet in warm weather; but it is sometimes very useful in difficult cases. It will, however, generally be easier and better to have a wet nurse.

J. Stewart Fowler

INFANTILE PARALYSIS.—(*See* POLIOMYELITIS.)

INFLUENZA.—It is most essential that the patient should be confined to his bed, or at least to his room, at the first symptom, however slight. The disease is most treacherous, and to neglect it is often disastrous. There is no specific for influenza; therefore symptoms must be treated as they arise. Much that is stated in the article FEVERS, ACUTE INFECTIOUS, will be found to be applicable to this disease. In many instances the attack begins suddenly, with pyrexia and various aches and pains. The ammoniated tincture of quinine in 1-drachm doses every four to six hours is an excellent remedy for these symptoms; or salicin in 20-gr. doses every hour for twelve hours, followed by 20-gr. every two hours for the next twelve hours (Turner). When there is headache, phenazone 10 gr., phenacetin 5 to 10 gr., or acetanilide 2 to 5 gr., may be given. Should these remedies fail to relieve pain, Dover's powder (up to 10 gr.) or some other form of opium should be tried. Heart failure is common in some forms of influenza; hence it may be inadvisable to employ baths or wet packs for pyrexia; sponging, however, is seldom unsafe. For acute failure of the heart, strychnine is the best remedy, combined with quinine if the temperature is much raised.

For weakness of the heart, more or less persistent, whether following an attack of syncope or of gradual onset, digitalis and caffeine are invaluable. Rest, and careful observation of the circulatory system, are also imperative, as in the case of diphtheria (*see* DIPHTHERIA). Bronchitis, and lobar and lobular pneumonia, are very common. The treatment appropriate to these conditions must be applied (*see* BRONCHITIS and PNEUMONIA). In lobular pneumonia, a mixture containing digitalis, chloride of ammonium, and nux vomica has in some cases proved very efficacious, as also has nitrite of sodium in 1- or 2-gr. doses. In the gastro-intestinal form, whey or peptonized milk should be given in small quantities frequently, and opium with some dilute mineral acid, e.g.:—

℞	Tincturæ Opii	℥v	Syrupi Tolutani	℥j
	Acidi Sulphurici Aromatici	℥x	Aquæ	q.s. ad ℥j

An attack of influenza is the cause of acute mental disturbance in some patients, who will, therefore, require careful watching during convalescence. Severe neuralgic pain, localized to a definite spot, is not uncommon after this disease. If the usual remedies for neuralgia fail, a blister over the seat of pain should be tried.

In epidemic times prophylactic inoculation with a mixed vaccine is recommended. The vaccine contains in 1 c.c. 400 million *B. influenzæ*, 80 million streptococci, and 200 million pneumococci. A first dose of 0·5 c.c. should be followed by a second of 1 c.c. after an interval of ten days.

The patient may be allowed to go amongst other persons as soon as he is well.

Quarantine period: if enforced, a week.

E. W. Goodall.

INSANITY.—(*See* MENTAL DISEASES.)

INSOMNIA.—Cases of insomnia, as met with in practice, divide themselves naturally into two groups, namely, (1) *Symptomatic insomnia*, and (2) *Intrinsic insomnia*.

1. **Symptomatic Insomnia** attends a vast variety of morbid states, and is secondary to them, or is part of them. Pain, pyrexia, frequent coughing, and dyspnœa, are clinical conditions which may prevent or shorten sleep. In such and in similar instances the cause of the sleeplessness is obvious, and the consequential character of the insomnia—that is, its dependence upon a distinct and sufficient cause—is clear. We may control sleeplessness of the kind in question either by the exhibition of remedies which directly cause sleep—hypnotics or soporifics—or by the employment of measures which combat

he cause of the insomnia, by removing pain, by reducing pyrexia, quelling cough, elieving cardiac disturbance and dyspnœa, and so on; or by using in conjunction ypnotics and remedies for the removal of the causes of the sleeplessness. The treatment f secondary insomnia is part of the treatment of a large number of diseases, and is given n other articles. If a hypnotic drug be needed in such a case, one of those described later nay be selected. It must always be remembered that preparations of opium are contra-ndicated, as a rule, in renal diseases and in bronchitis.

2. **Intrinsic Insomnia.**—These cases fall naturally, as to their causes, into three livisions, the *psychic*, the *toxic*, and the *senile*. In psychic insomnia, some severe mental hock or long-continued mental strain (such as financial worry or hard reading for an xamination) has excited or kept up such relative cerebral hyperæmia, that insomnia esults. In toxic insomnia, some ingested agent, as in alcoholism, or in excessive smoking f tobacco or snuff-taking, or as in the drinking of strong tea or coffee near bedtime, or ome autogenetic poisons such as arise in the gouty diathesis, in renal insufficiency, or in abitual constipation, keep up sufficient cerebral hyperæmia for the production of insomnia. In senile insomnia, the broken and short sleep is the result of senile degeneration of the maller cerebral arteries. In such degeneration, those blood-vessels are less elastic and ontractile than in health, and they may become dilated, so that the blood-supply to the erebral cortex is with difficulty reduced enough to permit of sleep.

Patients who are sleepless without physical discomfort are usually those of nervous emperament, and their impressionability as to insomnia is determined by psychic or oxic causes, or by senile changes in the cerebral blood-supply, or by these conditions in arious combinations.

Before beginning treatment it is important to try to get the patient to assume a right ttitude to his complaint. He should be told that insomnia is not so serious as he thinks, hat no one ever died of it, and that he is not in the least likely 'to go off his head' as result of it. He should be instructed to try not to think about it at all, and if possible o laugh at it, and, if he cannot sleep, not to lie and toss about in the dark, but to turn n the light and read or play 'patience' or do picture puzzles till he begins to feel drowsy. He should keep a glass of warm milk or some soup in a thermos flask by his bedside, and ake some with a biscuit or two if he feels hungry in the night. (*See also* NEURASTHENIA.)

TREATMENT.—As a rule, successful treatment of insomnia follows the discovery of ts cause. A hypnotic should be prescribed only in exceptional cases, and when its xhibition cannot be avoided. A removable cause of insomnia should never be allowed o continue. In the severer forms of psychic insomnia, the prompt use of a hypnotic will soon restore to the brain the power of sleeping, without further aid from drugs.

Acetylsalicylic acid (*Aspirin*) is often successful in mild cases. Two 5-gr. tablets nay be crushed and taken with a warm drink at bedtime.

Potassium bromide is the best hypnotic in well-nourished patients and in the slighter ases generally. It produces nervous calm, is a direct brain sedative, and quite safe. It nust be given in a full dose after getting into bed, 30 to 60 gr. dissolved in half a tumblerful f water.

Bromural[1] and *Adalin*[2] are excellent mild hypnotics which, while considerably more owerful than the bromides, are also non-toxic and non-cumulative. They are very seful in cases of mild insomnia from worry or excitement, and may be given in doses of 0 gr. at bedtime or on waking during the night. Their effect passes off in about four hours.

Opium, or one of its hypnotic derivatives, may be given, especially when pain prevents sleep; but is contra-indicated in children, in bronchitis, and in renal disease; it is unsuitable for habitual cases, and its exhibition should not be long continued, or its dosage much increased. In severe psychic cases it may act well, thus prescribed:—

℞ Pilulæ Saponis Compositæ gr. iiss
Ft. pil. One or two to be taken at bedtime.

Chloral is the hypnotic most used, and it is certain in its action. Its disadvantages

[1] Bromural is now prepared by Messrs. Allen & Hanbury under the name *Dormigene*.
[2] Adalin is prepared by Messrs. Boots.

are that sometimes it is a gastric irritant, it is a cardiac depressant, undesirable in heart disease or with a low blood-pressure, and the habit of taking chloral, which is a prevalent vice, may be induced. The officinal syrup of chloral hydrate is a good preparation. Each fluid drachm of the syrup contains 10·9 gr. of chloral hydrate. From ½ to 2 drachms of this syrup may be given at bedtime in a wineglassful of dill, peppermint, or other aromatic water, and repeated in a half dose in two or three hours, if necessary.

A combination of hypnotics is sometimes more successful than any of them singly; in such combination each acts better in a smaller dose than otherwise. Chloral and bromide of sodium or of potassium may be given together; or both may be combined with opium, thus :—

℞ Tincturæ Opii	♏v–x	Syrupi Chloralis	ʒss
Potassii Bromidi	gr. x–xx	Aquæ Menthæ Piperitæ	q.s. ad ʒiss

M. Ft. haust. To be taken at bedtime.

Chloral formamide (*Chloralamide*) is especially recommended in insomnia complicating disease of the heart. In such cases Hale White advises 25 gr. dissolved by stirring in 1 oz. of brandy, adding water to taste, taken about one hour before bedtime. On account of its disagreeable taste it is sometimes proposed to administer chloral formamide in capsules; but if the drug be given as a powder, it may be very slow in its action, and cause a drowsy day after a sleepless night.

Sulphonal, and its chemical allies, *tetronal* and *methylsulphonal* or *trional*, are powerful hypnotics, which do not depress the heart or irritate the stomach. None of them is safe if the kidneys be diseased, as each may cause hæmatoporphyrinuria. Each has the disadvantage of being comparatively insoluble in water, and their insolubility may retard their effect for some hours after they have been taken by the mouth. None of them should be administered for more than a few nights consecutively. While one of them is being taken, 20 to 30 gr. sodium bicarbonate should be given during the day, to prevent the urinary hyperacidity which these hypnotics cause by their action upon the blood. Each of these drugs is best given in a cachet, washed down with a little hot water, one hour before bedtime. The dose of sulphonal is 10 to 30 gr.; tetronal, 10 to 20 gr.; trional 15 to 30 gr.

Paraldehyde is a good hypnotic. It is a colourless liquid, with ethereal odour and pungent taste, soluble 1–8½ of water. It is best given emulsified with yolk of egg. It acts quickly, and does not depress the heart. The dose is from ½ to 2 fluid drachms. It has an unpleasant after-effect. For days after a single dose, a disagreeable smell is given to the patient's breath.

Barbitone (formerly *Veronal*) is a good hypnotic. It is a white crystalline powder, comparatively insoluble in water (1–160). It is cautiously given in cachets and in pills, for which latter, syrup of glucose is a good excipient. The dose is 3 to 15 gr.

Medinal is sodium-barbitone. Its action and dosage are the same as that of barbitone, but it is much more soluble, and can be administered if necessary by the rectum.

Dial, another homologue of veronal, is also a useful and rather powerful hypnotic. The average dose is 1½ gr. in tablet form.

Luminal (phenyl-ethyl-bartituric acid) is a powerful hypnotic especially useful when there is much excitement. The dose is 1½ to 5 gr. dissolved in hot water. It is more poisonous than veronal.

In many cases of chronic wakefulness from prolonged mental strain, the patient is anæmic. The insomnia cannot be cured unless the anæmia be cured. Hæmatinics are indicated, of which the best are iron and arsenic, singly or combined. The diet must be generous, containing plenty of fish, meat, and eggs.

The prescription of *alcohol* as a remedy in disease is often difficult and sometimes dangerous. To many people a 'nightcap' of toddy is a superfluous, perhaps hurtful, luxury. It gives, however, perhaps better than anything else, rest and sleep to the worried brain of feeble persons whose blood is poor. Alcohol is the best hypnotic in many cases of chronic psychic insomnia, when the patient is worried and weakly, sorrowful and anæmic. When alcohol is prescribed in the form of any of the fluids which contain it, in the treatment of insomnia, the reasons for the employment of the remedy should be explained, and it should be discontinued when the conditions which called for its exhibition have disappeared.

In the toxic kinds of insomnia, if the cause be the consumption of tobacco, alcohol, tea, or coffee, such consumption must be stopped or lessened, as the case may be. In the toxic insomnia of gout, or of chronic kidney disease, with a pulse of high tension, the following combination is useful :—

℞ Magnesii Sulphatis ℥ss | Sodii Citro-Tartratis Effervesc. ℥ss
Sodii Potassii Tartratis ℥j

M. Ft. pulv. One or two teaspoonfuls to be taken in half a tumblerful of water every morning, before breakfast.

In the toxic insomnia which sometimes accompanies habitual constipation and undue fæcal retention, and of which such fæcal retention may be the whole cause, the cure of the habitual constipation must be aimed at. If laxative drugs be necessary, the following modification of Marshall Hall's pill is useful :—

℞ Aloes Barb. | Extracti Taraxaci
Theriacæ | Saponis Mollis, singulorum
Extracti Glycyrrhizæ | partes æquales

Solve in aqua, et calore lente inspisse ; deinde divide in pilulas, pondere 2½ gr.
One or two pills to be taken at bedtime.

As a mild laxative, the following combination of remedies has proved excellent :—

℞ Magnesii Ponderosi | Mellis Depurati ℥j
Olei Ricini āā ℥ss

M. Ft. conf. One teaspoonful to be taken at bedtime.

Senile insomnia is very obstinate. One of the hypnotics before mentioned may be given, with exceptional caution as to dosage. In many cases the bromides, with full doses of hop or of henbane, afford the most efficient and least harmful medicinal means of relief.

(*See also* Bronchitis, Electrotherapeutics, Gout, Heart, etc.) *James Sawyer.*
(*Revised by R. Hutchison.*)

INTERMITTENT CLAUDICATION.—(*See* Cramp.)

INTESTINAL OBSTRUCTION.—(*See also* Intussusception.) The general heading 'intestinal obstruction' includes such different conditions as strangulation of a loop of intestine in an intraperitoneal fossa, obstruction by a foreign body, and stricture the result of carcinoma. The one feature in common is the necessity for early recognition, followed by immediate surgical treatment—there is no medical treatment of intestinal obstruction. Long-standing constipation alone will not produce symptoms which will mimic an obstruction calling for surgical interference.

In primary acute intestinal obstruction, the patient is suddenly seized by violent colicky abdominal pain ; this comes on in paroxysms and is accompanied by vomiting. In the early stages, between the attacks of pain, the abdomen appears normal, but during the attack a writhing coil of gut may sometimes be made out. Distention, fæcal vomiting, severe shock, are all late symptoms. Among the acute obstructions are strangulation by bands (including Meckel's diverticulum, and the appendix), intussusception, volvulus, obstruction the result of gall-stone impaction, internal hernia.

Chronic intestinal obstruction may reveal itself by increasing difficulty in getting the bowels to act, with attacks of colicky pain particularly in the right iliac fossa, with continuous diarrhœa, or alternating diarrhœa and constipation, all of which may be due to malignant disease of the large intestine. In others, repeated attacks of abdominal pain, with distention and visible peristalsis, may point to obstruction in the small intestine, the result of kinking by adhesions, or of tuberculous or other stricture. If not operated upon, all these cases tend to terminate acutely. In rare instances of carcinoma of the colon, the first symptoms noticed by the patient are those of acute obstruction.

In every case it is important to diagnose the cause of the condition, if possible. Infinitely less harm will be done by delaying operation ten minutes than by spending an extra ten inside the abdomen because the diagnosis was not made before operation. A careful history may enable this to be done, eliciting previous abdominal illnesses, pointing to the possibilities of strangulation by band or obstruction by gall-stone. In examining, the whole abdomen must be uncovered and the hernial regions carefully

investigated. Abdominal and rectal examination may reveal a gall-stone in the ileum, or a malignant growth may be felt.

Acute intestinal obstruction usually affects the small intestine, and apart from the common form in children—intussusception—it is generally due to adhesions from pre-existing disease or operation. These adhesions are usually the result of the neglect of surgical treatment at the most favourable time. Appendicitis is a fertile cause. If this disease were treated on modern lines—operation within the early hours of an acute attack, or even by forestalling its onset—many cases would be prevented. The acute obstruction due to volvulus of the sigmoid could be prevented if the preceding constipation had been effectually treated.

The sudden onset of severe abdominal pain, accompanied in many cases by vomiting and by rigidity, is most often due to a cause only relievable by surgical means. To consider an attack of this sort as due to biliousness, indigestible food, or fæcal accumulation, is one of the gravest of mistakes. Every surgeon could tell of dozens of useful lives lost through this practice. In many instances the patient is given an aperient or, if vomiting is a prominent feature, sedatives such as bismuth and opium, and a surgeon is not sent for until time has rendered the surgical nature of the case so evident that the most favourable period for operation has passed. In every case of severe abdominal pain, associated with abdominal rigidity, vomiting, or both, or in any abdominal case about which the slightest doubt exists, *no drugs or food* of any kind should be given. If the patient is very thirsty, water may be taken, but every effort should be made to keep the intestine at rest. If any doubt at first exists, a few hours' watching will reveal the nature of the case and enable prompt surgical intervention to be carried out. No harm will result from the delay of a few hours if neither drugs nor food are given. In acute intestinal obstruction, diagnosis rests on the history—the sudden onset of colicky pain and vomiting. In cases of abdominal emergency an enema should never be given before operation ; when fæcal accumulation causes chronic intestinal obstruction, we use it as *treatment.*

When the diagnosis has been made, operation should be carried out without loss of time. Few preparations are necessary. In late cases of intestinal obstruction, in which fæcal vomiting has supervened, the stomach should be washed out before operation lives are lost through neglect of this precaution. With regard to the anæsthetic, ether on an open mask, preceded by an injection of morphia and atropine, is ideal in the early cases. In the late ones, a combination of local and general anæsthesia, gas and oxygen with 1–400 novocain, is preferable ; or, if this is unobtainable, intraspinal analgesia.

Except when the disease has been located to the left side of the abdomen, or in the case of malignant disease of the descending colon or sigmoid, or of duodenal hernia, the incision should be made just to the right of the mid-line, below the umbilicus ; the inner edge of the rectus should then be defined and pulled outwards. The strangulating agent —band, Meckel's diverticulum, appendix—should be dealt with, and the condition of the gut investigated. If distention is great, it will be wise to open the gut, after protecting the abdominal cavity, and allow the stagnating contents to escape. If the bowel recovers its tone after this has been done, the opening may be closed in the usual way. If in doubt, a glass tube should be inserted for drainage.

If a coil of gut has become snared, its condition must be carefully investigated after removal of the obstructing agent. If it is unlikely to recover, resection should be carried out, remembering to do this through healthy gut. In most cases immediate anastomosis, end-to-end or lateral, may be carried out, but occasionally the condition of the patient will not admit of this, and a tube should be tied in with catgut.

When the obstruction is due to the impaction of a *gall-stone* in the lower ileum, it should be gently brought back to a healthy portion of gut and removed through a longitudinal incision. The same rule with regard to drainage applies here. If the condition of the patient is so bad that no search can be made, the most distended coil should be opened and drained by a small Paul's tube.

Volvulus is most commonly met with in the sigmoid, but may occur rarely in the ileo-cæcal region. In the sigmoid, after the obstruction has been reduced, colostomy should be performed. No attempt should be made to resect the affected coil. Reduction alone usually fails.

In acute obstruction due to *malignant growth*, resection is unjustifiable. The intestine should be drained central to the obstruction. When this is in the most common position—the sigmoid—if the growth is removable, the site of drainage should be so placed that at the following operation it can be included in the abdominal incision. Cæcostomy should only be performed in the late cases in which patches of gangrene are seen, or when it is on the point of giving way. When the malignant disease is at the splenic flexure, it is often safe to do a lateral anastomosis between transverse and descending colon such as can be used after later resection of the growth. When at the cæcum, it may be possible to do an ileocolostomy to the transverse colon.

After operation for acute intestinal obstruction the patient should be nursed sitting up in bed. Nothing should be given by the mouth, and if vomiting continues the stomach should be washed out and kept empty. Salines should be administered per rectum.

With regard to *aperients*. No attempt should be made in the early hours to obtain an action by the use of irritating drugs. After the intestine has had time to recover by rest, turpentine enemata, with or without a preceding injection of pituitary extract if distention is great, should be given. The return to food must be gradual. Secondary operation, when necessary, can usually be undertaken in from ten to fourteen days.

James Sherren.

INTESTINAL STASIS.—The treatment of this condition resolves itself into: (1) The lessening of intestinal putrefaction; (2) The removal of constipation; (3) The correction of any mechanical hindrances to the free onward passage of the intestinal contents.

1. *In order to lessen putrefaction*, all flesh foods should be eliminated as far as possible from the diet, and nutrition maintained by milk, farinaceous foods, and fruits. Intestinal antiseptics are not of much service, but small daily doses of calomel ($\frac{1}{10}$ to $\frac{1}{6}$ gr.) are perhaps the best.

2. *Constipation* should be treated on the lines laid down in the article on that condition.

3. *The mechanical hindrances* to be overcome consist in dropping of the organs, abnormal mobility of the cæcum and colon, the existence of bands, kinks, and adhesions, and chronic inflammation of the appendix leading to spasm at the ileocæcal orifice. Some of these conditions can be remedied by the treatment described for gastroptosis (q.v.); but if that fails, operation is called for. The operative procedure demanded will vary with the individual case, and it is advisable for the surgeon to keep an open mind in the matter. In some, division of bands is sufficient; others require fixation of part of the large bowel; in many appendicectomy is indicated. More extensive procedures, such as ileosigmoidostomy or partial colectomy, are only required in the more extreme cases. (*See* CONSTIPATION, SURGICAL TREATMENT OF.)

Robert Hutchison.

INTESTINAL WOUNDS.—(*See* ABDOMINAL INJURIES.)

INTRACRANIAL HÆMORRHAGE.—(*See* HÆMORRHAGE, INTRACRANIAL.)

INTRACRANIAL TUMOURS.—Earlier diagnosis, and more accurate topographical localization, are gradually making the treatment of intracranial tumours more promising. The great majority of cerebral tumours are of a malignant character and incapable of complete removal. Of the benign tumours, a large number are so situated that their removal is impracticable. It is therefore only on rare occasions that a tumour is met with which by reason both of its nature and its situation lends itself to radical treatment. Palliative measures, however, afford a degree of relief which compares favourably with that given by merely palliative operations elsewhere in the body. Blindness can be averted; the agonizing headache, for which drugs are useless, can be entirely removed; the distressing vomiting can be abolished; life can be prolonged for many months, and in some instances for years. Non-operative treatment avails nothing, and when once the diagnosis of an intracranial tumour has been made, the treatment belongs to surgery just as certainly as does the treatment of cancer of the bowel. Unfortunately, the nature and extent of a cerebral tumour cannot be foretold, and in many instances its exact

position cannot be diagnosed, with certainty. Operations, therefore, must necessarily often be of an exploratory character.

The operative treatment is either radical or palliative. Non-malignant tumours such as meningeal endotheliomata, which do not infiltrate the brain, may be removed so also may certain syphilomata and tuberculous masses. Some of the firmer gliomata may occasionally be removed successfully; and cysts may be evacuated or enucleated.

The methods of approach to an intracranial tumour are: (1) The osteoplastic flap (2) Removal of bone; (3) A combination of the two. The osteoplastic flap is suitable for those cases in which removal of the tumour is contemplated. If, on exposure, the tumour proves to be irremovable, the operation can be converted into a simple decompression, by taking the piece of bone from the flap, or cutting away more bone elsewhere at some more convenient site.

The essential aim of a simple decompressive operation is to afford complete relief to the increased intracranial tension without causing loss of function in any part of the brain. Herniated brain does not lose its function if the opening is large enough to allow it to protrude without any interference whatever with its circulation. Moreover, when an opening inadequate for the complete relief of tension has been made, the herniated and consequently partly-strangulated cerebral tissue is not the only part of the brain to lose its function. The selection, therefore, of a so-called 'silent area' of the brain, without regard to the position of the tumour, is a mistake; and it is better not to operate at all than to make too small an opening. The opening should be made as close to the tumour as possible, or at least over that intracranial compartment which contains the tumour. When even that elementary degree of localization is impossible, the bilateral subtemporal opening of Cushing affords a useful way out of the difficulty. This, in brief, consists in removal of the bone beneath the temporal muscle without disturbing its peripheral attachments; the muscle being split in the direction of its fibres, and retracted during the craniectomy. For tumours situated below the tentorium, a similar submuscular operation is available, the floor of the occipital fossa being removed so that the thick mass of the suboccipital muscles afterwards forms a protective covering to the cerebellar hernia. The free opening of the dura mater forms an essential part of any decompressive operation. Without this step, the craniectomy, save in a few rare instances, affords no relief of pressure and is quite useless. In every decompressive operation the scalp flap should be much larger than the bony opening, so that the suture line is placed at a safe distance from the herniated brain. If this is not done, fungus cerebri is apt to result, and to be followed by the almost inevitable consequence of meningitis. The flap should be most carefully and accurately sutured, so as to avoid any chance of leakage of cerebrospinal fluid, an accident which is apt to be followed by disastrous results.

Another palliative operation, applicable to certain cases in which a tumour is so situated as to produce its pressure effects chiefly by causing ventricular distention, consists in establishing a drainage track between the lateral ventricle and the subarachnoid space (*see* HYDROCEPHALUS).

Lumbar puncture, as a means of relief of intracranial pressure in tumour cases, has only to be mentioned to be condemned. It is liable to cause sudden death from herniation of the medulla and cerebellum into the foramen magnum. When, in a suspected tumour case, an examination of the cerebrospinal fluid for diagnostic purposes is required, only a very small quantity should be withdrawn by lumbar puncture.

Treatment by *x* rays and radium has been tried in some instances, the bony opening allowing of comparatively easy penetration of rays. Hitherto no marked improvement has been reported as having followed this line of treatment. *Percy Sargent.*

INTUBATION.—(*See* DIPHTHERIA.)

INTUSSUSCEPTION.—Operation should be carried out directly the diagnosis is made or reasonably suspected. It is unjustifiable to waste time in attempts at reduction by rectal injections. In the majority of cases a sausage-shaped tumour can be felt, but its absence does not contra-indicate operation.

The incision should be made just to the right of the middle line, and the lower part of the rectus muscle pulled outwards. The intussusception should be sought, and as much

duced by manipulation inside the abdomen as possible. The last portion should be duced outside the abdomen ; it should be done by squeezing and not by traction ; if, owever, it is difficult, it is justifiable to try gentle traction.

If it is irreducible, much will depend on the condition of the child. If the small testine above is very distended, temporary drainage should be used. If the condition the patient admit, the mass should be rapidly resected, and the end of the ileum united the ascending colon end to side.

Feeding should be begun as soon as possible after the operation ; if the child breast-fed, the mother should continue to feed it. *James Sherren.*

IRITIS.—The iris and ciliary body together form the anterior part of the uveal act. Anatomically they are continuous structures, and have a common blood-supply ; is therefore not surprising that they are frequently involved in the same inflammatory rocesses, though not necessarily to an equal degree.

The chief dangers which may arise in iritis are twofold :—

1. *Posterior Synechia* (adhesion of the posterior surface of the iris to the anterior lens apsule). When these adhesions involve the whole circumference of the pupil (*total annular ynechia*), the normal circulation of the ocular fluids is interfered with and glaucoma results.

2. *Lymph in the Pupillary Area* obscuring vision (occlusion of pupil).

The ciliary body, on the other hand, is the main nutritive organ of the eye, and supplies he aqueous and nourishes the lens and vitreous body. In cyclitis, therefore, the chief angers with which we have to contend are : (1) Opacities in the vitreous ; (2) Opacies in the lens (cataract) ; (3) Organization of the inflammatory products thrown out to the vitreous, which may lead to : (4) Detachment of the retina ; and later, (5) Disrganization and shrinking of the globe (phthisis bulbi).

The treatment of iritis and cyclitis have so much in common that they will be discussed ogether, and considered under the headings : (1) General, (2) Local.

General Treatment.—This consists in rest, dieting, purgation, and diaphoresis. In very case of acute iridocyclitis the patient must be confined to the house or bed. The diet uring the height of the attack should be restricted to milk and easily-digested foods, but soon as the severity of the symptoms have passed off the patient may be allowed to sume his ordinary diet ; stimulants are, as a rule, best avoided. In every case the eatment should be commenced by free purgation, and care taken to procure a daily tion of the bowels.

There can be little doubt that profuse diaphoresis is of great importance in the treatent of acute iridocyclitis, relieving pain, enhancing the action of mydriatics, and nding to cut short the attack. The best means of securing a free action of the skin the hot-air bath or the hot pack, combined, if necessary, with the subcutaneous jection of pilocarpine nitrate, $\frac{1}{12}$ to $\frac{1}{3}$ gr. If there is much pain and sleeplessness, ve grains of Dover's powder, repeated if necessary, will often give great relief, and at he same time encourage the skin action.

Many ophthalmic surgeons recommend mercurial inunction in every case of iridoclitis, irrespective of causation ; but the administration of the drug should be chiefly mited to cases intimately associated with syphilis, and to cases of sympathetic ophthalmitis.

Various diatheses play so important a rôle in the etiology of iridocyclitis that it is cessary, in discussing the general treatment, to refer to them somewhat fully. No ttempt, however, will be made to deal with the detailed treatment of these constitutional isorders ; but, in passing, brief mention will be made of the drugs which we have found ost generally useful.

Syphilis is the causal factor in more than one-half of all cases of iridocyclitis, either the hereditary or the acquired forms of the disease. A complete course of salvarsan r one of its substitutes should be given, when a rapid improvement may be expected. his must be combined with a course of mercury, inunction being a convenient form of dministering the drug. In the later stages, and in the more chronic forms, potassium dide is of the greatest value, and must be pushed to large doses (if necessary to 90 gr. er diem).

Gonorrhœa.—In this disease the eye affection generally shows itself in the gleety tage, and is often associated with joint affections. It is hardly necessary to point out

that the urethra, prostate, and vesicles must receive careful attention; gonococcal vaccine, together with the administration of potassium iodide and quinine, combined with local treatment, will, as a rule, rapidly alleviate the symptoms.

Rheumatism, especially in the chronic articular, rarely the acute, form, is undoubtedly a frequent predisposing factor in inflammation of the iris and ciliary body. Without attempting to discuss the general management of rheumatic affections, we may mention that acetylsalicylic acid is frequently of very great value in the more acute eye affections. In the more chronic forms potassium iodide is especially valuable.

Gout.—In rare instances the gouty diathesis is the exciting cause of the eye disease. In addition to local treatment, the diet must be regulated, stimulants given with caution, and a visit to a suitable spa is to be recommended.

Tubercle.—This form of iridocyclitis is most usually of the chronic type, and frequently, but by no means always, associated with nodules in the iris. The treatment must be directed to the improvement of the general health, and cod-liver oil should be given. In addition, carefully regulated injections of tuberculin should be tried. In some cases these are very useful, but unfortunately in the more severe cases a large proportion fail to respond to this or any other form of treatment; the sight is lost and the eye has to be removed.

Diabetes Mellitus may be the direct cause of a chronic form of iridocyclitis; and it is important to test the urine in every case where there is any doubt as to the causation. With local and general treatment these cases do well.

Metastatic.—A purulent form of iridocyclitis is not infrequently met with associated with some specific disease, e.g., cerebrospinal meningitis; or with some septic focus in other parts of the body, e.g., discharge from the ear. As a rule, the case develops into a panophthalmitis, with loss of sight and shrinking of the globe. In addition to local treatment, the primary source of infection must be eradicated as far as possible. If the panophthalmitis is acute, and pain a marked feature, and if the patient's general condition is otherwise satisfactory, the eye should be removed. Usually, however, the disease runs a more chronic course, free from pain, in which case the eye need not be excised.

Chronic Iridocyclitis.—For the most part the cases which fall under this heading have few symptoms beyond gradually failing sight; there is little or no pain, circumcorneal injection is never marked and often absent, while posterior synechiæ are frequently not found. The main signs are punctate deposits on the back of the cornea (keratitis punctata) and opacities in the vitreous. The keratitis punctata is often so fine that it will not be recognized without a magnifying glass and the use of a brightly focused light. A great deal of work has been done of late in trying to elucidate the etiology of these cases. They run a course strongly suggestive of infection, but when tubercle, syphilis, gonorrhœa, and chronic rheumatism have been excluded, a large number still remain unaccounted for.

Oral Sepsis is found in a high percentage, as would be expected from such a prevalent disease, and with the cure of this a certain proportion of the cases, differing considerably with various observers, get rid of the iridocyclitis; which shows that the pyorrhœa is either the direct cause, or at any rate an important factor, in interfering with the general nutrition. The oral sepsis should therefore undoubtedly be treated thoroughly, by scaling and regular brushing of the teeth, cleansing the sockets, or, if necessary, extraction.

Chronic constipation, or some form of colitis, is also a common associate of iridocyclitis, and may be a cause of toxæmia or direct infection. It should be treated energetically.

A bacteriological examination of the urine for tubercle or *Bacillus coli* should be made, and a careful search for some infective focus in any other part of the body, such as suppuration in the air sinuses communicating with the nose, in the middle ear or mastoid, or an inflamed pile or fistula, etc., and if such a focus be found it should as far as possible be removed.

But often even after a careful search for local or general infection no cause for the iridocyclitis can be assigned, and therefore no specific treatment is practicable. In this case the cyclitis must be treated on general lines. Protection must be given from cold winds and glare by wearing protecting tinted goggles, and a warning must be given not to ride in open carriages or motors, or on the tops of omnibuses, etc. A very limited use of the eyes for close work should be allowed, weak atropine drops given to keep the pupil

emi-dilated and the ciliary muscle at rest, counter-irritation to the temple, and hot bathing f the eye at bedtime.

A general tonic is advisable, such as malt, strychnine, phosphate of iron, or Tweedy's ill (quinine sulphate 1 gr., calomel $\frac{1}{6}$ to $\frac{1}{4}$ gr., extract of belladonna $\frac{1}{8}$ gr., confection of oses q.s. ; t.d.s., p.c.). In some cases injection of neosalvarsan, even when syphilis can e excluded, has proved of great use.

Malaria and Relapsing Fever.—Quinine and arsenic are especially useful.

Traumatic.—(*See* EYE, INJURIES OF.)

Sympathetic Ophthalmia.—(*See* OPHTHALMIA, SYMPATHETIC.)

Local Treatment.—This consists in protecting the eye from light, by means of a ad and bandage or dark glasses ; the use of atropine, hot applications, leeching, and listering. Atropine is our sheet anchor in the local treatment of acute iridocyclitis, its tion being threefold : (1) It dilates the pupil, thus preventing or breaking down posterior nechiæ ; (2) It paralyzes the ciliary muscle, and places the eye at rest ; (3) By contracting the vessels of the inflamed iris and ciliary body, it tends to relieve pain and reduce the nflammatory process. In a recent case of acute iritis it should be used in the form of ointment,* 4 gr. to the ounce, every two hours until the pupil is fully dilated ; but once that bject is attained, every four hours is quite sufficient.

It is always well to combine hydrochlorate of cocaine with the atropine in the proportion of 3 to 1, as by so doing we induce a maximum dilatation of the pupil, and at the ame time increase the analgesic effect. Should, however, the pupillary margin become irmly adherent to the lens capsule, and refuse to yield to the weaker applications, the trength of the atropine must be increased to 8 gr. to the ounce to endeavour to break down the adhesions ; it is seldom wise to use a stronger ointment than this, or alarming ymptoms of atropine poisoning may arise, e.g., dryness of mouth and fauces, fever, rash, allucinations, and delirium. Should these symptoms unhappily occur, they must be net at once by stopping the atropine, by the injection of morphia, and the administration f strong coffee.

The use of the strong (8-gr. ointment) atropine should not be continued for more than wo or three days, and at the end of that time we must return to the weaker (4-gr.). If dhesions have not yielded to this energetic treatment, they must be left ; but it should e remembered that many pupils, which have apparently resisted all treatment, may ilate in a week or longer under the influence of the fourfold battery of atropine, hot athing, leeching, and purging.

Substitutes for Atropine.—The use of atropine may lead to a marked local irritation, uch as eczema or erythematous swelling of the lids and even the whole side of the face, with chemosis of the conjunctiva. In such cases a substitute for the atropine must be used ; hyoscine hydrobromide, 1 to 2 gr. to the ounce, is the best ; but if this also gives ise to irritation, duboisine sulphate, 2 gr. to the ounce, may be tried. The application f ung. zinci oxidi, ung. calaminæ, or Lassar's paste to the inflamed skin may be found especially valuable.

Hot applications, either in the *moist* or *dry* form, are of the first importance. If the former be preferred, frequent hot boracic bathings answer admirably.† If the latter, covering the eye with a pad of absorbent wool, previously heated by contact with a can containing boiling water, or the use of the Japanese muff-warmer, with a pad of gauze between it and the eye, are both convenient and efficient forms for its application. Maddox's electric pad is a light and extremely ingenious invention which also works well when obtainable.

If the pain is acute, two leeches applied to the temple, not nearer the eye than the

---

* Ointment is preferable to drops, being more powerful locally, and less toxic generally.

† *Hot bathing*, to be effective, must be carried out thoroughly. A small bowl with some boracic lotion, a good-sized pad of cotton-wool, and a kettle of boiling water are required. The boiling water is added to the lotion, and the wool wrung out in this and applied over the closed eyelid. As soon as the pad becomes cool it is wrung out and heated again. As the lotion becomes cool, half is thrown away and more boiling water is added, and so on, keeping the pad as hot as can be borne, the strength of the boric acid being unimportant. Often the eye will stand greater heat than the fingers, and the pad can then be applied by means of a wooden spoon. Hot bathing should be carried out for at least twenty minutes 'by the clock', and between the bathings the eye must be kept hot by means of a dry pad of wool, with or without the muff-warmer.

margin of the orbit, will give the greatest relief, and, moreover, assist the atropine in dilating the pupil. The leeching may be repeated at intervals if the pain is a marked feature and the general condition of the patient one in which local depletion is not contra-indicated. Should the natural leech be objected to, or unobtainable, a satisfactory depletion may be brought about by artificial means, e.g., Heurteloupe's leech.

In the more chronic cases, counter-irritation by blistering the temple is often extremely beneficial. Treatment must be continued until all signs of inflammation of the eye have ceased; and even after the eye is white the use of atropine must be kept up for at least a fortnight; otherwise recurrence is extremely probable.

Operative Treatment.—The most serious complication in iritis is the occurrence of glaucoma. If glaucoma supervenes with a deep anterior chamber, and without complete binding down of the pupil to the lens capsule, a paracentesis must be performed to relieve the increased tension; and this can be repeated every second or third day if necessary.

If glaucoma with *total annular synechia* occurs in the acute stage, atropine must still be pressed in order to break down the adhesions; but if this fails, we must make some opening in the iris to restore the intra-ocular circulation. An iridectomy in the acute stage will probably become closed by lymph, and a less severe procedure is advisable, viz., Fuchs' quadruple puncture, which should be followed by iridectomy when the eye is quiet. After several attacks, when the pupil is nearly blocked, an iridectomy is indicated in the interval between the attacks, to prevent the occurrence of complete posterior synechia and secondary glaucoma.

Again, when the pupil has been occluded by lymph, an optical iridectomy may be indicated to improve vision.

Ilbert Hancock.
(Revised by W. T. Lister.)

ISCHIORECTAL ABSCESS.—(*See* Abscess.)

ITCH.—(*See* Scabies.)

JAUNDICE.—The treatment of jaundice must depend upon its cause (*see* Bile-ducts, Catarrh of; Gall-stones, etc.); but in all cases the amount of fat in the diet should be restricted, and the bowels kept active by the use of small doses of mercurials, along with salines. For the intense itching which is sometimes a distressing result of jaundice, the injection of pilocarpine ($\frac{1}{4}$ gr. daily or on alternate days) may be tried. Small doses of thyroid are also helpful, and aspirin at bedtime may promote sleep; but in many cases it is necessary to have recourse to the hypodermic injection of heroin or morphia.

Externally, strong alkaline baths are of use, or one or other of the applications described in the article Pruritus.

Robert Hutchison.

JAUNDICE, CATARRHAL.—(*See* Bile-ducts, Catarrh of.)

JAW, DEFORMITIES OF.—Deformities of the jaws and dental arches are frequent accompaniments of adenoids. The deformed jaw or arch is practically always subnormal in size, especially the maxilla, where the want of growth accompanying adenoids is more obviously felt. Treatment should begin early. Except for the fullness added by the erupting canines, the anterior part of the maxilla is hardly increased after ten, and is certainly finished by fourteen years. This means that the earlier adenoids or nasal obstructions are removed, the better for the patient's jaws and beauty; and that where possible, 'regulation' should be undertaken early. (*See* Adenoids.)

Joseph Geo. Turner.

JAW, DISLOCATION OF.—(*See* Dislocations).

JAW, FRACTURES OF.

I.—**The Inferior Maxilla.**—Fractures of the inferior maxilla are generally the result of direct violence; but occasionally, in cases of sepsis or tumour, muscular action may be sufficient to produce fracture.

Fractures may occur at (1) *The canine fossa*, either unilateral or bilateral, or unilateral through the canine fossa with a fracture of the opposite angle; (2) *The Alveolus*; (3) *The angle*; (4) *The condyle*; (5) *The coronoid process.*

1. *The Canine Fossa.*—The fracture is more or less vertical, passing through the anine fossa or the mental foramen. In unilateral cases the anterior part of the larger ragment is drawn downwards and backwards. In bilateral cases this deformity is imited to the central fragment, and is much exaggerated. The fracture is always ompound, the thin mucoperiosteum of the buccal side of the bone being torn. There ill be bruising and laceration of the soft tissues, abnormal mobility, with crepitus etween the bone-ends, and alteration in the line of the teeth. There is very grave danger f sepsis spreading from the mouth.

Treatment.—These cases should be treated, whenever possible, with the aid of a entist. As a temporary means of treatment, the two fragments may be brought into pposition with the teeth of the upper jaw, and fixed in this position by means of a four-ailed bandage applied in the manner shown in *Fig.* 44. Treatment should aim at com-lete control of the fragments, combined with ability to open the mouth, allowing dequate nourishment to be taken and the mouth to be kept thoroughly cleansed. This s best secured by the use of a dental splint.

The teeth should first be attended to, all carious stumps removed, and the rest of the eeth scaled and cleaned. It is not advisable to remove teeth loosened near the site of he fracture, as, in the absence of sepsis, these will soon ecome refixed in their sockets. A model of the lower teeth s then taken, either in two portions corresponding to the ragments, or, with the deformity corrected, in one piece. rom this model a vulcanite cap is made for the whole of he lower teeth, filled with a special cement and fitted over he teeth while the cement is yet soft. For these manipu-ations an anæsthetic will be required. The cap is kept in osition for three or four weeks, when the cement will have ufficiently loosened for the splint to be removed without ifficulty. If there be no teeth, a cap is made to fit over he alveolus as in Kingsley's apparatus, and fixed by means f wires leaving the angles of the mouth and a bandage assing under the chin. It is not advisable to employ wire plints fastened to the teeth to unite the fragments, as hereby sepsis is increased and there is a tendency for the eeth to be loosened.



Fig. 44.—Four-tailed Bandage applied to a Fractured Mandible.

2. *The Alveolus.*—Portions of the alveolus may be broken ff, either by the careless extraction of a tooth or by a blow vhich knocks out or loosens a tooth. As a general rule he separated portion is small and but little trouble ensues. If larger, it can usually be eplaced in position, and is maintained there by the surrounding soft tissues. If the outh be kept clean and the diet limited to soft food, the fragments will usually unite ; ut if sepsis ensues, they will be loosened and come away.

3. *The Angle.*—This is a much less common variety of fracture than the preceding ne. It is always caused by a direct blow over this portion of the jaw. Owing to the ide attachments of the internal pterygoid and masseter muscles there is little or no isplacement. There will be pain, swelling, and bruising, the pain being increased on iting. As a general rule the fracture is simple ; but occasionally it may reach sufficiently ar forwards to tear through the mucous membrane behind the last molar tooth, the racture in this case being compound. Owing to the lack of displacement, this variety s more likely to be overlooked than the others. If, however, the anterior fragment be rasped firmly, movements will be associated with pain referred to the angle.

Treatment.—When the fracture is simple, a four-tailed bandage should be applied or a week, so as to prevent undue mobility of the fragments. At the end of this time ny support may be dispensed with, but the patient must only be allowed soft food for nother two weeks, so that contraction of the masseter and pterygoid muscles is prevented. f the fracture be compound, careful oral antisepsis must be added.

4. *The Coronoid Process.*—Fractures of this portion of the bone are very uncommon.

Treatment.—If there be no separation, the jaw should be kept at rest as in a case f a fracture of the angle. When the coronoid process is separated, an open operation

should be performed, the fragments drawn into position, and fixed with a small silver wire suture.

5. *The Condyle.*—Fractures in this position may occur from direct violence, or less commonly by blows upon the chin. Either the neck of the bone is fractured, or the condyle itself splintered. There will be little or no displacement in either case, but in both there will be limitation of movement, and pain.

Treatment.—Operation will generally be required ; otherwise there will be a tendency for ankylosis of the joint to take place. If the neck be fractured, it may be possible to fix the two fragments by means of a small wire suture ; but if this fails, or if the condyle be fractured, it will be better to remove the condyle, to round off the remaining portion of the bone, and to turn in a small portion of the capsule or aponeurosis to prevent bony union.

II.—**The Superior Maxilla.**—Fractures may involve either one or both of the superior maxillary bones. They are commonly caused by falls on the face, but may also occur from gunshot wounds, or the alveolar process may be separated during the extraction of a tooth. In the common variety it is associated usually with severe contusion or laceration of the face. One or both bones may be separated from the face as a whole carrying with them the nasal bones, the malar bones retaining their normal attachments. The whole front of the face may be freely movable, with crepitus. Under an anæsthetic the lacerations should be cleaned and sutured, the bones replaced in their normal position and kept there by strapping, when union usually takes place rapidly. The oral and nasal cavities should be kept thoroughly cleansed by means of antiseptic washes.

If a portion of the alveolus be fractured, the mucoperiosteum may be also torn, the fracture then becoming compound. The fragment can, as a rule, be readily replaced and should never be removed unless completely detached. If kept clean it will frequently unite, and should necrosis occur the fragment may be removed at a later date.

The anterior wall of the antrum may be driven inwards, this at times occurring as a result of fracture and downward displacement of the malar bone. If unassociated with injury of the malar bone there will, as a rule, be little deformity, and treatment should be limited to maintaining asepsis of wounds of the skin or mucosa. If the malar bone be affected there will be marked deformity, and it will be necessary to replace this bone. A small incision should be made in the fornix, the anterior wall of the antrum laid bare, and attempts made to disimpact the malar bone by means of a periosteum elevator. If necessary, an opening may be made into the antrum, and the elevator inserted through it beneath the malar bone. When once disimpaction is carried out, the fragments can readily be replaced, and show but little tendency to leave their normal position. The wound in the fornix can then be closed and the mouth kept clean. In rare cases, involvement of branches of the infra-orbital nerve may give rise to neuralgia, which will require operation to free the nerve.

Albert J. Walton
(Revised by E. C. Lindsay

JAW, NECROSIS OF.—Necrosis of the jaw may be due to many conditions, and the amount of bone may vary from a small superficial sequestrum to the whole thickness of the jaw ; so that in severe cases there may be a spontaneous fracture of the lower jaw or extensive destruction of the upper jaw. The condition is more common in the inferior maxilla. The causes may be divided into (I) *Infective* and (II) *Chemical*, the former being much more common than the latter.

I.—**Infective.**—

1. *Compound Fractures.*—If the wound becomes infected, the underlying bone will participate in the sepsis, and necrosis will occur. This may be so slight in amount that no portion of bone is separated as a sequestrum. If more extensive, there may be destruction of a varying amount of bone, which may separate later. In the minor degree it may be sufficient simply to maintain oral asepsis until the sequestrum is free. If a local abscess forms it should be incised, but even if dead bone be felt it is generally preferable not to remove it until it is quite loose, lest the recently united fracture be again broken down. In more severe cases, a large portion of the bone may be destroyed, and owing to the amount of surrounding sepsis a more vigorous line of treatment will have to be carried out. A general anæsthetic being given, the mouth must be freely opened and the site of the fracture cleaned as far as possible. A free incision is made down to the

one through the mucosa, and if necessary other incisions made through the skin. rainage tubes are inserted wherever pus has collected, and fomentations applied. Oral ntisepsis must be thoroughly carried out in the after-treatment. Owing to the amount f destruction of the bone, it is important to keep the fragments in as good a position as ossible, so that when new bone is formed there will be little resulting deformity. If a ental plate has been used in the treatment of the fracture there will be little difficulty this, whereas if only a four-tailed bandage has been employed considerable displacement ay occur. No attempt should be made to remove the dead bone until a new sheath of one has been formed. If necessary the progress can be investigated by *x*-ray photographs, nd when the involucrum is formed the dead bone may be removed. It will generally e found, however, that by this time there are loose sequestra which may be removed ther from within the mouth or through one of the openings that have been made in the kin. In the case of the lower jaw the new bone formation is rapid, and a very serviceable aw may result, although several teeth may be lost in the process. When the upper jaw affected the sepsis is generally less extensive, and it may be possible to provide adequate rainage by means of incisions in the mouth. If the pus spreads up to the antrum, this ructure will also require drainage. In this position sequestra are not so extensive as a ule, but the amount of new bone formation is relatively slight, and repair may indeed e only fibrous.

Compound fractures as the result of gunshot wounds add a further difficulty in the natter of non-union. It has been estimated that 10 per cent of fractures of the jaw in he recent war showed non-union after prolonged trial of conservative treatment. This esults from the actual loss of bone, due not so much to the initial destruction as to the xtensive shattering followed by infection and necrosis. It is in this type of case that one-grafting has given good results.

A dental splint is applied fitted with a screw-bar to ensure gradual correction of the eformity. All septic foci, in the shape of sequestra, foreign bodies, and decayed teeth re removed, and all sinuses and septic wounds should have been well healed for at least wo months before any bone-grafting operation is attempted.

Two main types of operation can be performed. The first is by means of a pedicled one-graft as suggested by Cole, where a section of the lower border of the mandible is emoved by an electrical saw, the anterior belly of the digastric muscle being left attached s a pedicle. It is carried back into the gap, where it is fixed in place by means of silver ire. The second type is by means of an osteoperiosteal graft from the tibia or rib. It s essential in performing the operation that all communications with the oral cavity hould be avoided, and that absolute hæmostasis should be observed.

2. *Alveolar Abscess, and Secondary to Stomatitis.*—When the condition follows an nfection of the tooth socket after removal of the tooth, the pathological changes are the ame as those occurring in a case secondary to infective stomatitis. With the exception f very severe cases, the lesion is usually limited to the alveolus. Small sequestra are ormed which project through the ulcerated gums as greyish, hard spicules. With their eparation, and the aid of the usual antiseptic mouth-washes, the ulcers soon heal.

When the tooth is *in situ* the amount of destruction will be very variable. In the ess extensive cases there will be a swelling of the soft tissues over the infected tooth, which, if the tooth be not immediately removed, will soon be followed by pus formation. When pus is formed it may be sufficient, in the early stages, to incise the swelling from he mouth and to administer antiseptic mouth-washes. In such cases no actual sequestrum nay separate. In more advanced cases the pus will pass through the periosteum and nvolve the surrounding tissues, so that a subcutaneous abscess is formed. By this time a larger area of bone has usually undergone necrosis. It will now be necessary to open he abscess externally, or the pus will spread widely into the submaxillary tissues or even nto the neck, and one or more disfiguring sinuses may form. The longer the condition s left unoperated upon, the more extensive will be the separation of the periosteum and he necrosis of bone. If necrosis has taken place, the sinus will continue to discharge, nd the separation of the sequestrum take several months to be completed. In all cases f persistent sinus the tooth should be removed, as a carious tooth may be sufficient, without the existence of a sequestrum, to prevent its closure. If a sequestrum be present, t is not advisable to remove it at once, for not only will it be difficult to determine the

limit of the dead bone, but fracture of the jaw, with consequent deformity, is likely t occur owing to the absence of the new sheath of bone. In removing the sequestrum which is generally dense and well defined, the operation should, if possible, be carried ou through the mouth, so as to limit the subsequent scar deformity. If the infection i situated near the angle of the jaw, care must be taken that contraction of the massete and pterygoid muscles, leading to closure of the jaws, does not ensue. In the case of th upper jaw, an extensive abscess may form on the palatal surface without bone destruction but especially in the case of infection of the bicuspids or first molar there is, as in th previous variety, danger of infection of the antrum of Highmore.

3. *Pyæmia.*—An infection of the jaw through the blood-stream is rare, and occur usually in children. The treatment follows the lines for acute osteomyelitis elsewhere Free incision must be made down to the bone both externally and internally, and a portio of its outer wall removed to allow free drainage of the infected medulla. It is inadvisabl in most cases to remove dead bone at once, as some form of apparatus will then b necessary to maintain the shape of the jaw, and sepsis will thereby be increased Removal of sequestra should be deferred till *x*-ray photographs have demonstrated th formation of sufficient new bone to maintain the continuity of the jaw.

4. *Syphilis, Tubercle, and Actinomycosis.*—In syphilis, necrosis may occur in th tertiary stage. As the result of a gummatous mucoperiostitis, the underlying bone usually the hard palate, necroses, and a perforation of the palate appears. Antisyphilitic treatment should be at once instituted. Sequestra may require removal later, and i some cases perforation of the palate will necessitate closure, either by a plastic operatio or by the use of an obturator.

Tuberculous necrosis is rare, but usually affects the upper jaw by extension from th nose or face. The formation of sequestra is infrequent, and treatment should be carrie out on general lines.

The lower jaw is one of the commonest sites affected with actinomycosis. In th early stages treatment will consist in removal of any carious teeth which may be th source of infection, and in the administration of large doses of potassium iodide. Later when sinuses are present, it will be better to scrape them thoroughly with a sharp spoon the wounds being then lightly plugged with iodoform gauze. (*See also* ACTINOMYCOSIS.

II.—**Chemical.**—

Mercury, Phosphorus, and Arsenious Acid.—Necrosis of the jaw from chemica causes has become a rare occurrence since the almost universal adoption of amorphou phosphorus in the manufacture of matches, and the assumption of the principal rôle i the treatment of syphilis by the arsenic compounds. After the intramuscular injectio of an insoluble mercurial salt in the accessory treatment of syphilis, toxic signs stil occasionally appear. The teeth become tender, the breath foul, and ulceration of th gums occurs. The site of the intramuscular injection should be incised and thoroughly cleansed of all trace of the mercury, iodide of potassium be administered, and the mouth frequently irrigated.

Arsenious acid, used for devitalizing the pulp of a tooth, may escape into the socke and give rise to a localized necrosis of the alveolar process.

In all three varieties, the treatment of the necrosis and sequestra follows the sam lines as in a pyogenic infection.

Albert J. Walton
(Revised by E. C. Lindsay.

JAW, TUMOURS OF.—Tumours of the jaw may be of many varieties; for no only may they arise from the bone and periosteum, but, the periosteum and mucou membrane being in certain areas in close relationship, tumours peculiar to this latte structure may invade the substance of the bone. The jaws also contain the teeth an the antrum of Highmore, from either of which tumours may arise. It will be foun convenient to classify these tumours according as they affect the following parts: (I) *Th mucoperiosteum;* (II) *The jaw proper;* (III) *The palate;* (IV) *The antrum of Highmore* (V) *The dental tissues.*

I.—**The Mucoperiosteum.**—These tumours, which are often loosely grouped togethe under the term *epulis*, are of many different varieties, and may occur in either the uppe or lower jaw. The majority arise in association with the tooth sockets, generally spring ing from the periodontal membrane, and are often associated with pyorrhœa alveolaris.

1. *Angeiomata.*—This condition, which is sometimes described as a vascular epulis, identical with the angeiomata found elsewhere in the skin or mucous membrane.

Treatment.—If small and pedunculated it may be found possible to excise them atirely; which treatment, as in the case of cavernous nævi elsewhere, will give the most tisfactory results. In other cases, where they are too extensive for this form of eatment, a cure may be brought about by electrolysis or multiple punctures of the lvano-cautery. Such form of treatment may leave a fibrous mass which it may be cessary to excise later.

2. *Papillomata.*—These tumours form soft wart-like masses, generally situated close the teeth. They are best treated by snipping off with a pair of scissors. Any resulting eeding may be controlled by the aid of a styptic.

3. *Granulomata.*—These are one of the common forms of epulis, and often can only distinguished from the fibrosarcomata by microscopical examination. In nearly all ses they occur in association with carious teeth.

Treatment.—Owing to the fact that these tumours arise from the periodontal embrane, it is necessary not only to extract the carious tooth, but thoroughly to remove ie affected portion of the membrane. Excepting in the very early cases it is doubtful this can be successfully accomplished by scraping out the tooth socket. Moreover, it often impossible to determine accurately whether the tumour is granulomatous or sarco-atous. For these reasons it is better to extract the teeth on either side of the tumour, id with a small chisel to remove thoroughly the affected portions of the alveolus, together ith the periosteum.

4. *Fibrosarcomata.*—These commence in the same position as the granulomata. The ajority of cases of so-called fibrous epulis are in reality cases of fibrosarcoma.

Treatment.—In the early stages the tumour will be removed by the same method that in use in the case of granulomata, and if the alveolus and periodontal membrane freely taken away there is but little likelihood of recurrence. In the later stages it will necessary to remove the jaw much more freely. If the tumour has not yet involved e body of the bone, it may be possible, in the case of the lower jaw, to leave a bar of one at the lower border of the mandible so that the contour of the jaw is maintained. , however, there is doubt as to the safety of this procedure, or if the tumour has been pidly growing, the whole thickness of the jaw should be removed. Before doing a rtial excision of the jaw it is necessary, in the case of the lower one, to have a plate or turator made, so that it can be inserted at the time of the operation, and the two maining fragments be thus maintained in their normal position until sufficient new bone s been formed. Such an operation should always be carried out by an external incision. is not wise, for the sake of avoiding a small and insignificant scar, to take the risk of t cutting sufficiently wide of the tumour.

5. *Myelomata.*—This condition is more common in young people. It commences, so, as an enlargement of the process of gum lying between two adjacent teeth. It grows pidly, and forms a soft, dark, purple mass which tends to ulcerate and bleed readily. was formerly known as a malignant epulis.

Treatment.—If small, the adjacent teeth should be removed, the tumour with the fected portion of the alveolus then being excised with a chisel, it being generally necessary take out a much larger portion of the alveolus than is the case with the other varieties. later cases, owing to the extent of the tumour, it may be necessary to extract several eth.

6. *Epitheliomata.*—Epithelioma of the gums may arise as a primary condition, or condary to a lesion of the tongue or floor of the mouth.

Treatment.—If seen early it may be possible to remove only a portion of the lower w, the operation being then carried out on the same lines as those indicated in the case fibrosarcoma, but at the same time the lymphatic glands in the submaxillary region ould be thoroughly extirpated. In later cases, if the glandular involvement is not too tensive to forbid operation, it is better to remove the affected half of the horizontal mus of the lower jaw; or if the upper jaw be affected, to take away the whole of the perior maxilla.

II.—**The Jaw Proper.**—These tumours correspond to those arising in bone elsewhere, id may therefore be innocent or malignant.

1. *Osteomata.*—These more commonly arise from the superior maxilla, and are then usually seen springing from the outer surface, especially from the nasal processes. In other rare cases the condition is diffused over the whole surface of the face, and is then described as leontiasis ossea. Apart from these cases, which are possibly inflammatory, osteomata are rare; but they may occasionally occur as small bony outgrowths on the alveolar processes, whilst on the lower jaw they are more common at the angle and at the region of the mental foramen.

Treatment.—The tumours situated on the anterior surface of the nasal processes will, owing to the deformity, usually require removal. They will generally be situated too high up for removal by an incision in the fornix, and hence they must be exposed through an incision made in the labionasal fold. The excess of bone may be removed either with a chisel, a dental drill, or a small saw.

2. *Myelomata.*—Apart from the doubtful myelomata growing from the mucoperiosteum of the alveolar processes which have been described already, true myelomata originating from the centre of the bone may occasionally be found. They are more common in the lower jaw, and have all the characteristics of the myelomata of the long bones elsewhere.

Treatment.—If these cases are diagnosed early, before they have led to destruction of the inferior maxilla, they may be removed by a local operation. It is unnecessary to do even a partial resection. The surface of the bone may be laid bare, preferably by an incision running in the submaxillary region. The outer wall is then chiselled away and all the tumour material thoroughly scraped out. Any hæmorrhage into the cavity should be carefully stopped, and the walls swabbed with pure carbolic acid. If sufficient of the outer wall is removed, the soft tissues on being returned to their normal position may eradicate the cavity. If the cavity is large, it may be either plugged with gauze and allowed to granulate up, or filled with one of the absorbent stoppings.

3. *Sarcomata.*—These may be either periosteal or endosteal, the former being the more common. They are either of the round or spindle-celled type.

Treatment.—In all these cases it is probably better to remove the whole of the affected half of the bone. Any attempt at local removal is almost certain to be followed by recurrence. Even if the whole of the affected part of the lower jaw be removed, it is very probable that metastasis will occur, this being one of the most malignant types of growth.

III.—**The Palate.**—Tumours in this portion of the jaw are uncommon.

1. *Adenomata.*—These are generally regarded as being the commonest tumour of the palate.

Treatment.—The tumour should be removed by an elliptical incision, the edges of which are sutured together.

2. *Papillomata.*—These may occur on the soft palate in the neighbourhood of the uvula. They are slow-growing and usually soft, owing to the moisture of this position. Occasionally they may ulcerate, and in older people may be the starting-point of epitheliomata.

Treatment.—If giving rise to trouble, they should be excised, and the edges of the wound sutured together with catgut.

3. *Epitheliomata.*—Epithelioma generally occurs in the palate owing to direct spread from the tonsils.

Treatment.—If seen in the early stages it may be possible to eradicate the disease by operative means. For this purpose a modification of Mickulicz's operation may be employed. In this method, the affected tissue is reached by a curved incision beneath and behind the angle of the jaw, this portion of the bone being removed, if necessary, to give a better view. The glands of the neck should be dissected out at the same time.

4. *Sarcomata.*—These tumours are rare in the palate, but occasionally may occur as a rapidly-growing round-celled variety.

Treatment.—If there is any doubt of the nature of the tumour, a portion should be removed for microscopic examination, as it is only in the early stages that successful operative measures can be carried out. If a positive diagnosis be made, a partial resection of the superior maxilla on the affected side must be performed, the orbital plate being left, but as much as possible of the affected half of the soft palate being taken away.

IV.—**The Antrum of Highmore.**—Tumours in this position are very complex in nature. They all tend to lead to distention of the cavity, and to be relatively far advanced before diagnosis is made.

1. *Myxomata.*—These arise from the epithelium lining the antrum. They tend to undergo degeneration, and hence are often described as cysts of the antrum.

Treatment.—The condition is often diagnosed as a chronic inflammatory change, with obstruction of the orifice. In such a condition, however, the affected side will be more opaque to transillumination, and an exploratory puncture will show the presence of pus. Under these circumstances an opening should be made in the outer wall through the superior fornix. The myxomatous tissue should be evacuated, and the lining membrane of the cavity thoroughly scraped out. This will lead to destruction of the epithelium, and hence it is wiser at the same time to make a free opening into the corresponding nasal cavity for the purpose of drainage.

2. *Sarcomata.*—Of the two varieties of malignant growth occurring in this situation, sarcoma is the more common. It may occur in relatively young people, and start from the sub-epithelial tissue or from the bone.

3. *Epitheliomata.*—If primary within the antrum, this tumour is usually of the villous and columnar-cell type, and tends to occur in rather more elderly patients. It has already been mentioned that an epithelioma starting elsewhere may pass upwards and invade the antrum.

These two tumours cannot, as a rule, be distinguished from one another until microscopic sections are taken.

Treatment.—When a diagnosis has been made, and if the tumour be still confined to the superior maxilla, an excision of that bone should be carried out. The whole of the affected maxilla, including the orbital plate, should be removed, and care should be taken to see that no portion of the growth be left in the region of the sphenomaxillary fissure. A preliminary laryngotomy should always be performed and the pharynx plugged, so that all growth can be thoroughly removed from the deeper areas. If microscopic sections show that the tumour is an epithelioma, the glands of the neck should be removed at a second operation.

V.—**The Dental Tissues.**—These are rare tumours; the following are the more usual types:—

1. *Epithelial Odontomes, or Fibrocystic Disease of the Jaw.*—These tumours are generally believed to arise from persistent remnants of epithelium connecting the enamel organ with the common enamel germ. They are most commonly seen in the lower jaw. They are generally encapsulated, and are composed of a multitude of small cystic spaces, the septa between which may occasionally be ossified.

Treatment.—If the tumour be small, and near the alveolus, access may be obtained by means of an incision through the oral cavity. If larger, an incision through the skin will be necessary. An opening should be made into the tumour, and all the diseased tissue thoroughly removed with a gouge and chisel. Care must be taken to remove every portion of the tumour, leaving only a smooth bony lining to the cavity. The resulting defect in the jaw is plugged with gauze, and the cavity allowed to granulate up.

2. *Follicular Odontomes, or Dentigerous Cysts.*—The e always occur in association with an unerupted tooth. The tooth is one of the permanent set, and the lesion is more common in the lower jaw of young adults.

Treatment.—An incision should be made down to the swelling, if possible through the mucous membrane. The outer bony wall of the cavity is removed, the unerupted tooth extracted, and the epithelial lining thoroughly scraped out. The resulting cavity is packed with gauze and allowed to granulate up.

3. *Fibrous Odontomes.*—

Treatment.—The mass should be laid bare as in the previous conditions, and the whole fibrous tumour dissected out from the bone, the resulting bony cavity being plugged with gauze.

4. *Dental Cysts.*—These are always found in association with a carious tooth. The sacs are not uncommonly bilateral, and may be multiple. They are more commonly attached to the bicuspids and molars, and in the upper jaw may be sufficiently large to invade the antrum.

Treatment.—The smaller cysts are usually removed whole when the carious tooth is extracted. Larger sacs which have led to enlargement of the bone should, if possible, be opened through the mouth, the fluid removed, and the cavity thoroughly scraped out with a sharp spoon. The opening is then plugged with gauze until it has granulated up to the mouth meanwhile being kept clean with antiseptic mouth-washes. *Albert J. Walton.*
(Revised by E. C. Lindsay.)

JOINTS, ANKYLOSIS OF.—(*See* Ankylosis of Joints.)

JOINTS, TUBERCULOUS DISEASE OF THE.—The factors governing the management of a case of tuberculous disease of a joint are: (1) *The age of the patient*; (2) *The stage of the diseased process*; (3) *The social conditions and environment of the patient*; and (4) *The particular joint affected.*

1. It is generally accepted that articular tuberculosis, when it occurs in children and is recognized early, is an eminently curable disease; and that, given favourable conditions and abundance of time, it can usually be arrested without recourse to operative measures. In adults, and even in adolescents, on the other hand, it is less amenable to conservative measures, and operative interference more frequently becomes necessary.

2. Whatever be the age of the patient, conservative treatment should be employed when the disease is recognized in its early stage, i.e., when slight impairment of movement, with commencing atrophy of muscles, stiffness and weakness of the limb, and neuralgic pains are the only symptoms present. Even when the disease has advanced to the stage in which the limb assumes an abnormal attitude, with characteristic boggy swelling of the region of the articulation, and starting pains occur in the joint at night, conservative measures, if persevered with sufficiently long, may succeed. When, however, marked displacement of the articular surfaces has taken place, suppuration with the formation of sinuses has occurred, and *x* rays reveal advanced disease in the constituent bones, and particularly if the general health is deteriorating, recourse should be had to operation without delay.

3. The importance of the social element lies in the fact that success with conservative measures largely depends upon the patient being placed under the most favourable conditions as to fresh air, feeding, and supervision—conditions which are only attainable in the homes of the well-to-do. Among the poorer classes, which yield by far the largest proportion of cases of joint tubercle, proper conditions can only be obtained in an institution where the patient may remain for many months. Even among the poor, however, home treatment on conservative lines often yields eminently satisfactory results, especially in children, when the parents have sufficient patience to persevere over a prolonged period.

4. In the upper extremity, in addition to arresting the disease, treatment must be directed towards preserving the movements of the affected joint, or, if ankylosis occurs, to ensuring that the attitude assumed is the most useful from the functional point of view—slight abduction at the shoulder, flexion to a little less than a right angle at the elbow, and slight dorsiflexion at the wrist.

In the lower extremity, while mobility should be retained if possible, ankylosis is not so undesirable, provided the weight-bearing capacity of the limb is not interfered with. The hip and knee should be kept in the extended position, and the ankle in the right angled position.

The details of treatment will be referred to with the individual joints.

Principles of Treatment.—In treating tuberculosis of a joint, it is important to bear in mind that the disease resolves itself into a contest between the invading organisms and the elements of the tissues in which they have found a lodgement. In most cases, during the early phase of the disease at least, the margin between the attacking strength of the bacilli and the resisting power of the tissues is a narrow one, and very little is required to turn the balance in favour of the tissues. The insidious mode of onset, the slow progress of the illness, and the gradual development of the pathological changes in the joint, all indicate that the struggle is a close one. The object of treatment is to raise the bodily resistance above that of the tubercle bacillus. So long as the infection is a purely tuberculous one this is comparatively easy, but if the infection becomes 'mixed' by the introduction of other bacteria, and the system has to contend with the toxins of

yogenic as well as of tuberculous organisms, it becomes much more difficult. Hence ie importance of maintaining the skin intact, or of guarding against a mixed infection i the course of operative procedures and in the subsequent dressing of a wound or sinus. he proliferative changes in the tissue-cells, and the infiltration of the area with leuco-tes, are designed to ward off the bacterial attack, and afford us a hint as to the line of eatment which will best aid the tissues in their protective struggle.

Constitutional Treatment.—The first, and perhaps the most important step towards lacing the patient in a favourable condition to overcome the local infection, is to raise ie resistive powers of his blood and tissue-cells by general constitutional treatment. urely local treatment will have little or no effect so long as the general health remains low par. He must be placed under the best obtainable hygienic conditions, living and eeping in freely ventilated rooms, and if he can live in the open air entirely so much the tter. The benefit of fresh air and sunshine in the treatment of tuberculous affections generally recognized and need not further be emphasized.

The food should be selected so as to include all the elements of an easily digested and ourishing diet. Milk, eggs, underdone butcher's meat, butter, and other animal fats re specially useful, and cod-liver oil with malt may be added if necessary. Fresh vege-ables and fruits, cooked or fresh, should also be given. Tonic drugs, such as syr. ferri hos. co. or a mixture of the 'three syrups'—Easton's, Fellowes,' and Parrish's—may be iven as indicated. Constipation must be avoided, as the resulting intestinal toxæmia nds to lower the resisting power of the blood-plasma and cells, thus favouring the local ction of the tubercle bacillus.

Tuberculin.—While tuberculin alone will not cure tuberculosis in a joint, it often roves a valuable accessory in raising the resisting power of the tissues. It has hitherto iven its best results in early cases, but its scope is gradually being extended as a result f wider experience. It is contra-indicated when there is a swinging temperature, when ther serious symptoms are present, or when a mixed infection has taken place. Tuber-ulin is best given hypodermically, but in out-patient work it has yielded satisfactory esults when given by the mouth, beginning with a small dose—$\frac{1}{8000}$ mgrm. of T.R.—and, there is no rise of temperature, doubling the dose in a week. The dose is gradually ncreased, but should never exceed $\frac{1}{100}$ mgrm. (W. G. Fenwick).

Direct Sunlight (Heliotherapy).—Rollier, at Leysen, near Geneva, has obtained xcellent results in surgical tuberculosis under a régime which includes continuous xposure of the patient to the action of the sun's rays. The penetration of the actinic ays is assumed to increase metabolism and to raise the hæmoglobin index, and so ncrease the patient's resistive power. In northern climates this method is not often racticable.

Local Treatment.—The local measures to be adopted vary according to the stage f the disease and the particular joint affected. They may be classed under the headings f *conservative* and *operative* treatment.

Conservative Treatment.—Except in the more advanced stages of the disease, onservative measures should always be tried in the first instance; but the patient or his riends must be warned at the outset that this is of necessity a prolonged process, lasting or many months and calling for continuous supervision, otherwise they are apt to lose atience and relax their vigilance. They may be encouraged to persevere by the promise hat if the conservative measures employed are successful the patient will have a more seful and shapely limb than is likely to be obtained by operative interference.

Rest.—The first essential is to place the joint at complete rest, and to maintain mmobilization until all pain, tenderness, and other signs of progressive disease have dis-ppeared. When the lower extremity is implicated it is best to confine the patient to ed until the more prominent symptoms have subsided, and thereafter to provide him vith an apparatus which, while fixing the affected joint, permits him to take a certain mount of exercise and to get into the open air. In the case of the upper extremity, onfinement to bed is seldom necessary. The attitude in which the limb is fixed is letermined by considering the position in which the affected joint will be most useful in he event of recovery taking place with ankylosis. If the limb has already assumed an ndesirable attitude it should be gradually restored to a more normal one. Forcible orrection under anæsthesia is to be avoided, as it is liable to accelerate the disease.

During the period that the limb is immobilized, massage and electrical treatment are no only unnecessary but are actually harmful.

Means of Securing Rest.—The most direct means of immobilizing a joint is by encas ing it in some form of rigid splint, e.g., *plaster-of-Paris*, either in the form of a complet 'case', or in sections, e.g., Croft's splint, which can be removed as often as is necessar for purposes of examination or to admit of local applications being employed. *Poro plastic felt* has many advantages as a removable splint—it is light, easily moulded, an durable. *Undressed cowhide*, soaked in hot water and vinegar, has similar advantage *Wire, perforated tin, aluminium, celluloid*, and other materials are also available. *Gooch splinting* and other forms of wooden splint are not suitable for this purpose.

Extension by weight and pulley, either alone or in combination with a splint, is valuable means of securing rest, particularly in the lower extremity. (*See individua joints.*)

Discarding of Splints.—The most difficult point to decide in the course of treatmen is when to remove the restraining apparatus and allow the joint to be used. Under n circumstances should this be done while there is pain, tenderness, local increase of tem perature, or swelling of the joint, and it is well to wait until all evidence of active disea has been absent for two or three months before removing the splints. Even then th patient should be given his freedom gradually. The splint may be removed for a fe hours at a time, then left off during the night and worn during the day, and later it ma be worn only while he is out-of-doors. Information regarding the progress toward recovery may be obtained by periodic *x*-ray examinations. The slightest return of pai or any other symptom is an indication for again immobilizing the joint. After the splint have been dispensed with, gentle massage may be employed to restore the tone of th muscles, but passive movement of the joint should be avoided. The voluntary move ments of the patient will restore the mobility of the joint in good time if the disease ha been arrested. The patient should be seen at regular intervals for some months afte splints have been discarded, to make sure that there is no recrudescence of the disease.

Artificial Hyperæmia.—Various measures are employed to induce an artificia hyperæmia of the joint and its surroundings, which will increase the reactive change around the tuberculous focus, bringing up an excess of leucocytes and protective fluid to aid the tissues in their contest with the bacilli.

Bier's Constricting Bandage.—The simplest and most generally applicable of thes measures is the application of an elastic bandage on the proximal side of the affected join sufficiently tight to congest the parts beyond by obstructing the venous return, withou at the same time interfering with the arterial flow. The skin is protected by a layer o lint, and when the bandage is applied with the proper degree of tension the part beyon becomes purplish-blue in colour and there is slight œdema. It must not cause pain: i it does, it is too tight and should be readjusted at once. The bandage is kept on fro one to two hours at a time, and is conveniently applied morning and evening. It shoul not be left on during sleep. In the intervals, the limb is retained in its splint and th œdema is allowed to subside spontaneously. This adjunct to the treatment is often highl beneficial. Once the proper degree of tension has been determined, the re-application o the bandage may be left in the hands of an intelligent parent or children's nurse.

Klapp's Suction Bells have the same effect, when applied to small joints. Th suction action is maintained intermittently for from half to three-quarters of an hour once or twice daily.

X Rays.—In so far as these are beneficial, they probably act by inducing hyperæmi of the tissues. They are subject to the objections that burning of the skin may occur and that they tend to produce undue cicatricial contraction. The exposures are mad once a fortnight.

Injection Treatment.—In certain forms of synovial disease attended with serou effusion, a mixture consisting of 10 per cent iodoform in glycerin may be injected int the joint cavity after aspirating the fluid. A large exploring needle is introduce obliquely through the tissues, so as to make a valvular track and prevent leakage: th fluid is withdrawn by suction with the syringe, and from one to two ounces of the mixtur are injected. The puncture opening is then sealed with collodion. There is frequentl a local reaction, manifested by redness of the skin, and sometimes the temperature rise

100° or 101° after the injection. The process may be repeated at intervals of two or ree weeks.

Formalin and glycerin (2 to 3 per cent), charcoal and glycerin (10 per cent), and bismuth d white vaseline (10 to 30 per cent) may be employed in place of iodoform. They obably all act by producing hyperæmia, rather than by their bactericidal properties.

The injection treatment is specially useful in peri-articular abscesses connected with int disease. It is sometimes preferable to open the abscess by a small incision, scrape e walls with a sharp spoon, and close the wound after filling the cavity with iodoform d bismuth paste (B.I.P.P.)

Graduated Pressure.—In cases of tuberculous hydrops with œdema of the synovial embrane and peri-articular tissues, the absorption of inflammatory exudates may be omoted by graduated pressure applied by means of imbricated layers of adhesive aster. The absorptive action is increased with a layer of lint smeared over with mpound mercury ointment (Scott's dressing).

Operative Treatment.—This is only to be considered when conservative measures ve failed after a fair trial extending over several months, or when the disease is eady far advanced. This rule should be adhered to in all cases of joint tubercle children, as conservative treatment yields better functional results, interferes less ith the growth of the limb, and is less liable to be followed by generalized tuberculosis the form of meningitis or peritonitis, than operative treatment. It may be relaxed the case of adults, in whom bone growth has ceased and the disease is more intractable, d who cannot for economic reasons afford the time necessary to give conservative easures a trial.

When operative measures are called for in children, the minimum amount of bone ould be sacrificed, and special care be taken not to damage the epiphyseal part of the ne. Erasion of the joint is therefore to be preferred to a set excision. In adults, com-lete removal of the articular surfaces and careful dissection of the synovial membrane re more frequently necessary.

Amputation for tuberculous disease of joints, except perhaps of the ankle and wrist, now rarely called for.

TUBERCULOSIS OF INDIVIDUAL JOINTS.

Joints of Fingers and Thumb.—All the joints of the affected digit must be im-obilized by means of a moulded poroplastic or leather splint (*Fig.* 45). In children it best to enclose the whole hand in the apparatus. Hyperæmia is induced (p. 514) by pplying Bier's elastic bandage above the wrist for an hour morning and evening. When ne articular ends of the bones are implicated, the joint should be excised early to avoid xtension of the disease to the tendon sheaths.



Fig. 45.—Leather splint applied to tuberculous disease of the first metacarpophalangeal joint.



Fig 46.—Leather splint, covered with kid, applied to a tuberculous wrist-joint.

Wrist-joint.—This joint is seldom affected with tubercle in children; in adults the isease is often associated with pulmonary tuberculosis. The disease begins in the syno-ial membrane, but spreads to the carpal bones and tendon sheaths. The wrist tends o become flexed, and the hand and fingers droop towards the palm.

A moulded splint of poroplastic, or leather (*Fig.* 46), is applied so as to fix the fingers, vrist, and forearm in the position of slight dorsiflexion, which is the most useful atti-ude in the event of ankylosis occurring. The writer has found Scott's dressing highly eneficial in cases of tubercle of the wrist, and also artificial hyperæmia. To induce yperæmia the constricting bandage is applied half-way up the forearm. To introduce odoform into the joint, the needle is inserted immediately below one or other styloid rocess.

In uncomplicated cases conservative treatment may be persevered with for ma months, but when the joint condition is associated with phthisis, and the improveme is not evident, excision is called for. If the disease involves the tendon sheaths, a sinuses with mixed infection are present, it may be desirable to amputate in t interests of the general health.

Elbow-joint.—Tubercle at the elbow is common in children below the age of te and the bones are frequently implicated early in the disease. The joint usually becom fixed in an attitude midway between flexion and extension, and midway between pron tion and supination. A moulded poroplastic or leather splint extending from the axi to the wrist is applied with the arm flexed to a little less than a right angle, and the ha semipronated and dorsiflexed. To induce hyperæmia (p. 514) the constricting band applied just below the level of the insertion of the deltoid, and, to concentrate t congesting effect on the elbow, the hand and lower two-thirds of the forearm may firmly bandaged from below upwards.

To inject iodoform, the most direct access to the cavity of the joint is obtained inserting the needle between the lateral condyle and the head of the radius. In cases synovial disease with hydrops, Scott's dressing is suitable. If the *x* rays reveal a progre sive localized focus of disease in bone, this may be incised, scraped out, and the cavi filled with iodoform paste, without opening into the articulation. Such limited operatio often hasten recovery considerably.

Excision of the joint is seldom necessary in children, but in adults and adolescen it is frequently the best means of eradicating the disease and securing a movable joint

Shoulder-joint.—Tubercle of this joint is most common in young adults, and owi to the mobility of the scapula, which enables the patient to use the limb without induci pain in the shoulder, the disease is often well established before advice is sought. It m take the form of a localized focus of caseating tubercle in the head of the humerus, or caries sicca.

As recovery by conservative treatment usually involves ankylosis of the joint, t limb should be fixed in an attitude of abduction at the shoulder, with the forearm a hand directed forwards, which gives the most useful functional position. This attitu is best maintained by a plaster-of-Paris splint, embracing the thorax and the affected lim as far as the wrist. A removable leather or poroplastic splint may be made by the instr ment maker if it is necessary to obtain access to the joint for local treatment, e.g., to de with a cold abscess or to dress sinuses. If hyperæmic treatment is to be adopted, it best done by injecting iodoform and glycerin into the joint, t needle being inserted just laterally to the coracoid process, just below the acromion process and the spine of the scapula.

If conservative measures fail, the joint must be excise and the limb fixed in the abducted position.

Joints of the Toes.—The first joint of the great toe is th most frequently involved. Fixation in a plaster-of-Paris cas which should include the whole foot, is suitable in the earlie stages. If it is desirable to employ hyperæmia treatment, removable poroplastic or leather splint is to be preferred. E cision of the joint is sometimes necessary, and yields excelle results.



Fig. 47.—Leather side-splints for tuberculous disease of the ankle-joint.

Ankle-joint and Tarsus.—In children, conservative measure if sufficiently long-continued, give satisfactory results, but adults the disease is less amenable and operation is mo frequently called for. Disease of the ankle is often associat with pulmonary phtnisis, a complication which may make advisable to remove the secondary focus as soon as possible.

The foot is immobilized at right angles by means of a poroplastic leather (*Fig.* 47 or plaster-of-Paris splint, and while the symptoms are acute the patient is best confin to bed. Later, a Thomas's knee-splint is applied, and, with a patten on the opposite foo and crutches, he may get about without bearing his weight on the affected foot. A co stricting bandage to produce hyperæmia is applied well above the ankle. To inject t joint with iodoform the needle is inserted below one or other malleolus and then push

pwards alongside of the talus. Localized foci in individual bones may be enucleated y operation. In advanced cases, particularly when complicated by phthisis, Syme's mputation is to be preferred to excision of the joint.

Knee-joint.—In the early stages of any of the numerous forms in which tubercle of ie knee may present itself, the patient should be confined to bed until all acute symtoms have subsided. The joint tends to assume an attitude of flexion with eversion of he leg and foot, and this should be corrected gradually by means of an adaptable osterior splint (poroplastic, leather, or metal). Light extension with weight and pulley s often useful in restoring the position to the normal. At the same time a Scott's dressng may be applied if there is much effusion into the joint, or hyperæmia may be induced y a band applied half-way in the thigh. The foot and leg should be enclosed in a firm andage applied over cotton-wool, to concentrate the congestive action on the region of he knee.

When all acute symptoms have subsided and the position of the limb has been estored to the normal, a Thomas's knee-splint is applied, with or without extension by trapping attached to the lower crossbar, and the patient is allowed to get about on rutches, wearing a patten on the sound foot. During this stage of the treatment hyperæmia should be induced for an hour or more morning and evening. The splint can seldom e discarded within a year.

Iodoform may be injected into the joint by inserting the needle on the medial ide of the ligamentum patellæ or into the upper pouch when this is distended with luid.

Peri-articular abscesses frequently form during the progress of knee disease, and are reated by being opened, scraped, filled with iodoform and bismuth paste, and closed gain. When conservative measures fail, erasion of the joint is indicated in children, nd excision in adults. Amputation is rarely necessary.

Hip-joint.—Hip-joint disease is much more common in children before puberty than t any other age. At whatever stage it comes under treatment recovery is a very slow rocess, and the friends should be warned that under the most favourable conditions the reatment will last for at least a year and may even take longer. As ankylosis usually ccurs, the functional result is not perfect, and as the growth of the limb is interfered with here is some degree of shortening, which will necessitate the wearing of a thick-soled boot throughout life. Complete rest in bed with weight extension (1 to 6 lb.) is imperative until all signs of active disease have disappeared. The affected joint should be kept in a position of moderate abduction, and this is best attained in children by the addition of a long splint with a hinge opposite the affected joint. To prevent the child twisting his body towards the diseased side, a continuous long splint is applied to the healthy side. A double Thomas's hip-splint may be adapted for this purpose. When the acute symptoms have subsided, a single or double Thomas's hip-splint is applied and the child gets about on crutches, wearing a patten on the sound foot. Iodoform may be injected into the joint, by introducing the needle upwards, backwards, and medially at a point about two inches below the anterior superior spine, passing under the lateral border of the rectus femoris muscle.

Peri-articular abscesses are treated on the usual lines.

Operative treatment is only to be had recourse to when every effort has been made without success to arrest the disease. Then the upper end of the femur is excised and ankylosis obtained in the abducted position.

Sacro-iliac Joint.—This condition is often associated with disease of the iliac bone, the sacrum, or the lower lumbar vertebræ, and it is frequently accompanied by the formation of a cold abscess pointing towards the pelvis or in the buttock. So long as acute symptoms are present, the patient must be kept in bed, with extension or other restraining appliance applied to the affected side. When the active symptoms have subsided, the patient, if a child, may be fitted with a double Thomas's splint, which admits of his being moved into the open air. In adults, a single Thomas's hip-splint, with a patten on the opposite foot, allows him to get about on crutches. Cold abscesses are treated on the same lines as in other joint affections. Operation should only be considered when the *x* rays reveal a sequestrum or gross disease of the surrounding bones.

Alexander Miles.

KALA-AZAR.—The parasite of kala-azar is identical with that of Delhi Boil, a is amenable to a similar line of treatment. Tartar emetic has proved to be eminent successful. The drug is made up in a 2 per cent solution, and given by the intraveno route. The injection should be given every third day, commencing with $\frac{1}{2}$-gr. dose a working up to a maximum of $1\frac{3}{4}$ gr. (5·8 c.c. of the solution). Treatment should be co tinued for at least two months after cessation of fever and after all symptoms have di appeared. A total amount of 30 gr., or over, of tartar emetic should be given. Progre should be gauged by the diminution in size of the liver and spleen and the rapid increa of weight of the patient. For children under six years of age, 1 c.c. of the solution shou be the first dose, and 3 c.c. the maximum. The employment of organic and less tox salts of antimony, such as the acetyl-p-aminophenyl, has been followed by more rap and striking results than those obtained with the tartrate.

Iron and arsenic tonics during convalescence are indicated to counteract the anæmi Attention should be focused on the dietary; good nutritious food is essential. Tl patient has a clean tongue, and if he has a hunger he should be permitted to satis his appetite.

P. Manson-Ba

KELOID.—This is a fibro-cellular growth of the corium, forming an excessive sc tissue, generally arising on the site of an injury, such as a burn or cut, after surgical oper tions, or in vaccination scars; occasionally it apparently commences spontaneously.

The treatment has usually been unsatisfactory, and by surgical methods often disa trous. Occasionally the condition gets well of itself. Internally, thyroid extract h proved beneficial in some cases, given in moderate doses. Arsenic has also been trie Phenacetin, antipyrin, or aspirin, and also quinine, are prescribed for the relief of pai The growing tendency may be checked, and the pain and irritation sometimes complain of allayed, by the application of a 10 to 25 per cent ichthyol ointment, or one containi 2 to 4 per cent of salicylic acid; or a plaster-like ointment made of lead plaster and soa plaster, of each 3 drachms, with vaseline to the ounce, to which icththyol may be adde Mercurial plaster continuously applied is agreeable in some cases. In some painful cond tions, belladonna, cocaine, and menthol applications give relief; so, too, a mixture of equ parts of chloral hydrate, camphor, and menthol may be painted on the part. Morph and cocaine hypodermically have been given to relieve very painful conditions, but a objectionable.

Hypodermic injections of fibrolysin (thiosinamine) have proved curative in son cases. This drug may also be given by the mouth in 3-gr. doses. Small repeated doses x rays are of great value in most cases, and often rapidly remove the lesion, but care mu be exercised not to produce a telangiectasis by too frequent or too prolonged exposure

Cautious operations by the electrolysis needle may often improve the condition, an may be curative for small growths, a current up to 3 ma. being used, and the negativ needle inserted at the edge of the growth obliquely towards the centre; or the positiv needle may be inserted in the centre of the tumour, and the negative in various poin at the periphery, and the results carefully watched; but a current of less intensit should be used in this case, and the positive needle should be insulated where it is i contact with the skin.

Ionization with chloride of sodium is always worth trying. Repeated injections 5 drops of formalin (40 per cent) into the substance of the keloid, after a local anæstheti have cured some cases, but are painful. Injections of oil with 20 per cent creasote hav been made into the growths with satisfactory results, but these are very painful (creaso 1 c.c., sterile olive oil 15 c.c.; dose 2 to 5 min.). Small, very prominent areas of keloid ma be destroyed by applications of the solid carbon dioxide for one or two minutes, but, th tissues being so non-vascular, the resulting ulcer takes a long time to heal up.

The author has recently obtained very satisfactory results from the hyperæmi method produced by Bier's suction cups applied daily, followed by applications of salicyli acid ointment or mercurial plasters:—

R	Acidi Salicylici	gr. x–xx	Unguentum Lanolinum	ad	℥j
	Zinci Oxidi	gr. xx			

Some excellent results have been obtained from radium. (*See also* Scars.)

W. Knowsley Sibley

KERATITIS.—(*See* CORNEA, DISEASES OF.)

KERATOCELE.—(*See* CORNEA, DISEASES OF.)

KIDNEY, MOVABLE.—The efficient treatment of movable kidney is intimately dependent upon the proper diagnosis. Four distinct classes of cases will be met with :—

1. Patients with a symptomless movable kidney.
2. Patients with movable kidneys where the other abdominal organs are also loose, and where there are well-developed signs of neurasthenia, but no severe renal pain.
3. Patients with recurrent attacks of renal colic, with or without hæmaturia, which are obviously due to mobility of the kidney.
4. Patients with movable kidneys which are the seat of intermittent hydronephrosis, of stone, or of other disease.

In *Class* 1 no treatment is necessary ; nor is it advisable to acquaint the patient with the undue mobility of the organ, if she is unaware of the abnormality.

In *Class* 4 the treatment is operative, and the difficulty lies chiefly in the diagnosis.

In a clearly-defined example of *Class* 2 the treatment is non-operative, while in a pronounced case of *Class* 3 nephropexy is indicated.

The intermediate cases between the last two classes give rise to difficulties in diagnosis, and account for many failures in treatment.

Non-operative treatment suitable for cases in *Class* 2 and some doubtful cases in *Class* 3 is as follows :—

The treatment of neurasthenia should be carried out ; the increase of the body fat should be encouraged by diet, cod-liver oil, and milk in spare subjects, and an abdominal belt should be worn. The belt should support the abdominal wall, and press upwards and backwards. It may either be a separate structure, or a specially made attachment to a well-fitting corset. The latter is preferable when it can be carried out, for then there is no need for the irksome perineal straps which are necessary to prevent the detached belt from working upwards. Kidney belts are made of many materials, and the details of their structure may be left to a good instrument maker, or a corset maker guided by the surgeon. They should have an insertion of strong elastic webbing at either side, and are better laced than buckled, since the latter method of union is more bulky. They should be stiffened by one or two vertical supports of whalebone.

Pads of various kinds have been used. No form of pad can press with sufficient force or precision to maintain the kidney in place without at the same time causing troublesome pressure upon the colon and other abdominal organs. A pad in some degree restrains the movement of the abdominal wall on the side of the movable kidney, and in this way gives a sense of comfort and support. The best form of pad is a flat indiarubber bag, which is distended with air or glycerin, and fits into a pocket in the proper position on the inside of the belt. The belt is worn over a well-fitting under-vest, and is discarded at night, but reapplied before rising from the recumbent posture.

The patient with a movable kidney should avoid sudden and violent movements. Horse and other vigorous exercise should be interdicted. The danger is, however, more frequently of the opposite nature, and these patients should not be allowed to indulge in a semi-invalid existence, spending their lives upon the couch or bed.

Operative treatment consists in nephropexy, and there are many varieties of the operation, dependent upon the individual taste or experience of the surgeon.

Operation is indicated in all cases where genuinely severe symptoms can be focused on the movable kidney, where enteroptosis is not a marked feature of the case. It is likely to be followed by complete relief where definite crises of renal pain are present, where hæmaturia attends these attacks or follows exertion, and where signs of intermittent hydronephrosis, even of a slight degree, can be elicited.

Operation is imperative where hydronephrosis, although intermittent, is marked, and where stone or other renal disease has been diagnosed. (*See also* GASTROPTOSIS and NEURASTHENIA.)

J. W. Thomson Walker.

KIDNEY WOUNDS.—(*See* ABDOMINAL INJURIES.)

KNEE-JOINT, INTERNAL DERANGEMENT OF.—Internal derangement of the knee includes several different conditions, of which the most important are: (1) Displacement or rupture of the semilunar cartilages; (2) Loose bodies; (3) Hypertrophied synovial fringes; (4) Rupture of the crucial ligaments or fracture of the tibial spine.

Rupture of the semilunar cartilages or of their attachments is characterized by a sudden onset of symptoms following a twist of the knee, recurrent attacks of pain, with locking of the joint, and frequently a difficulty in attaining complete extension of the joint; these are often followed by effusion into the joint.

Loose bodies have no characteristic mode of origin, but they produce a very sudden painful attack in the knee, which, however, does not become locked. They can often, but not always, be seen by the *x* rays.

Hypertrophied synovial fringes produce recurrent attacks of pain and weakness in the knee, accompanied by effusion, but there is nothing definitely characteristic about these attacks.

Rupture of the crucial ligaments follows severe violence directly applied to the joint. In well-marked cases some degree of instability of the knee results, which takes the form of a tendency to subluxation of the tibia forwards (anterior crucial) or backwards (posterior crucial) upon the femur.

It is a matter of great importance to realize that internal derangement of the knee may be due to any one of these causes, because if attention is directed merely to the commonest—viz., a displacement of the internal semilunar cartilage—failure will often result from treatment directed solely to this condition. In this connection it should also be observed that it is very common for certain classes of men, especially workmen who benefit under the Compensation Act, and soldiers, to complain of recurrent attacks of pain and weakness of the knee, without any real organic lesion existing in the joint. Some of these are malingerers, others are neurotics, all are very unsatisfactory subjects for operative treatment. The neurotic or malingering patient should be recognized by the indefiniteness of the origin or character of the pain, and by the fact of the pain being constant and not associated with any serous effusion. Such a patient should be treated by such psychical or moral force as can be brought to bear upon him, but certainly not by the surgical operation of removal of a cartilage. Such an operation only serves to aggravate the condition and to bring surgery into discredit.

1. **Torn or Displaced Cartilages.**—For the true case of torn cartilage, operative treatment is usually so satisfactory that time should not be wasted in other remedies. But two considerations have to be taken into account before undertaking the operation. The first is the chance of bringing about recovery by simple rest. The second is the value of knee-cages or cartilage-trusses. If the patient seeks advice directly after the original accident which has caused the injury, then it is well worth while to attempt a cure by rest, always provided that there is good reason to suppose that dislocation of the cartilage has been reduced. The best test of this is to ascertain, not only if the knee can be extended, but if pressure in the direction of hyperextension can be borne without pain. This indicates that no part of the cartilage remains impacted between the articular surfaces of the femur and tibia. The rest should be maintained by a light plaster cast including the whole thigh, leg, and foot, to be worn for three weeks in bed, followed by a caliper splint fixed in the walking-boot for six weeks. During the latter period the knee should be flexed, once night and morning, and the leg massaged. When, however, the patient presents himself several weeks after the original injury, if the knee cannot be extended fully without pain, and, most of all, if several attacks have occurred, then it is quite useless to rest the limb in the hope that the torn cartilage will become fixed in position.

As to the value of apparatus, this should never be considered in a case where the diagnosis is clear, unless the patient refuses operation. Knee-cage splints are usually unsatisfactory because they are inefficient. Any apparatus which is designed to prevent recurrence of the displacement of a cartilage can only effect its object if it prevents any rotation of the tibia upon the femur without preventing flexion. In order to carry out this object, there must be a well-fitted moulded leather splint fitted to the thigh and coming well down to the femoral condyles, and another moulded splint grasping the leg. These two parts should be connected with side steel hinges, the joints of which are exactly

opposite the most prominent parts of the condyles, and the lower parts of which run right down the leg and fit into sockets in the heel of the boot.

Various kinds of cartilage trusses are made and advertised. These are all useless, because they merely press upon the outer surface of the knee, where they may prevent the cartilages from slipping outwards—a movement which if it occurs would be harmless—but are powerless to limit an excursion of the cartilage inwards into the cavity of the joint.

The operation for torn semilunar cartilages is one of the most satisfactory in surgery, provided it is done for real cases of this lesion and done efficiently.

There is seldom any difficulty in deciding which cartilage is at fault, because the patient is quite definite in localizing his pain to the inner or outer aspect of the knee, placing his finger on the triangular space between the condyle of the femur, the tuberosity of the tibia, and the patellar ligament. In the great majority of cases, it is the internal cartilage which is at fault. This is probably because this cartilage is firmly attached all round its periphery to the head of the tibia by the coronary ligament, and to the broad internal lateral ligament where this structure crosses it. The external cartilage, on the other hand, is more mobile than the inner, first because the tendon of the popliteus muscle intervenes between it and the lateral ligament, and, secondly, because its cornua curve in towards the spine of the tibia instead of following the margin of the tuberosity, as is the case with the internal cartilage. In twists of the knee the external cartilage can therefore slip out of harm's way, whilst the internal cartilage, more firmly fixed, becomes torn. The tear may be through the anterior cornu, or across the anterior part of the cartilage, but more frequently the coronary ligament is torn in front of the lateral ligament, or the cartilage itself is split into an inner and an outer portion, the former becoming displaced into the intercondylar space.

The operation, though simple and short, should only be undertaken under perfect conditions as regards asepsis and by an experienced surgeon. The leg is prepared by picric acid or iodine and encased in sterile stockingette. It hangs over the end of the operating-table. The incision may be vertical, horizontal, or oblique in various directions. The best incision is one which is oblique, pointing downwards and forwards towards the patellar ligament. The advantage of this direction is, that if the front part of the cartilage is found to be intact, the incision can be prolonged as a U round the joint so as to permit of turning up the patella in order to explore the joint thoroughly. The incision is made through the stockingette, and the edges of the latter are clipped to the skin by Michel's clips. The joint is opened by cutting through the aponeurotic capsule and the synovial membrane. Special care must always be taken not to injure the internal lateral ligament. As much of the injured cartilage should be removed as possible, without injury to the other structures in the knee-joint. This generally includes rather more than the anterior half of the cartilage. If the posterior part of the cartilage is firmly fixed and cannot be brought forward, then it is wiser to leave it in place than to attempt to free it by cutting in the dark. In closing the joint, the synovial membrane, aponeurosis, and skin are sewn separately, and if there has been much oozing into the joint, it is a wise precaution to place a few strands of silkworm-gut as a drain and to remove these after twenty-four hours. Some surgeons apply a tourniquet to the thigh before the operation, and they do not ligature any vessels, but trust to the hæmostatic effect of a tight bandage applied to the knee before the tourniquet is removed.

The after-treatment is important. The best results will be obtained by avoiding the use of any splint. The knee is placed over a small pillow between sand-bags. Movement is then left to the patient's own instinct, and is to be encouraged when it can be carried out without pain. Rest in bed is only necessary for a week or ten days after the operation.

2. **Loose Bodies in the Knee.**—Loose bodies in the knee may be of various shapes and sizes, and they may be single or multiple. They are usually composed of fibrous tissue, cartilage, and bone in varying proportions. They are either invisible or else throw a very faint shadow under the *x* rays, and this does not show up against the dense bones of the knee. Therefore it is easy to miss their detection, and repeated skiagrams in various positions should be taken in all doubtful cases. When the diagnosis is certain, then there should be no hesitation about treatment, but the loose bodies should be removed without delay. Their continued presence in the joint not only gives rise to constant apprehension with repeated attacks of severe pain, but will bring about changes in the joint surfaces

of the nature of osteo-arthritis. It is only when the joint has become disorganized, as for example, in Charcot's disease, that it is not worth while to remove the loose bodies.

The loose body may be removed either through a small incision made over it, or else by means of a free opening of the joint. The former method used to be much advocated before the use of *x* rays and when asepsis was much more uncertain than it is at present. It is only possible when the loose body can be located and fixed by palpation in one of the superficial pouches of the joint. When the loose bodies are multiple or their position is variable, it is much better to expose the joint cavity freely by chipping off the tibial tubercle and turning up the patella. The exposure has the great advantage of allowing a complete survey of the interior of the knee, and if, as frequently happens, there exists with the loose bodies a condition of hypertrophied synovial fringes, then these can be dealt with at the same time. It may happen, however, that the loose bodies lie deeply in the synovial pouches behind the condyles. In this position they can be located usually by a profile skiagram, and they should be removed by appropiate posterior incisions.

3. **Hypertrophied Synovial Fringes.**—The synovial membrane of the knee-joint may become hypertrophied as the result of repeated attacks of synovitis or of the more constant irritation of chronic inflammation, e.g., osteo-arthritis. Thus in old cases of internal derangement of the knee due to other causes—e.g., displaced semilunar cartilages or loose bodies—the lesion often becomes complicated by a hypertrophy of the synovial membrane. The structures chiefly affected are the ligamentum mucosum and ligamenta alaria, which run between the intercondylar notch of the femur and the synovial and fatty pad below the patella. Projecting tags of synovial tissue in this situation are apt to become caught between the articular surfaces of the joint, and this accident will cause pain accompanied by effusion. In such a case, if the trouble has been of recent origin, an attempt should be made to reduce the synovitis by prolonged rest, i.e., by fixing the knee for three months in a leather splint or some form of walking caliper. But in old standing cases the only remedy is to turn up the patella, after chipping off the tibial tubercle, and cut away all excess of synovial and fatty tissue.

4. **Ruptured Crucial Ligaments.**—The crucial ligaments consist of two strong bands inside the knee-joint. The anterior runs from the back of the external condyle in the intercondylar space downwards and forwards to the head of the tibia in front of the spine. Its rupture allows of the displacement forwards of the tibia upon the femur. The posterior runs from the internal condyle at the front of the intercondylar space backwards and downwards to the back of the head of the tibia behind the spine. Its rupture allows of the displacement backwards of the tibia upon the femur. When both ligaments are ruptured, the knee is more or less flail. This lesion, whether affecting one or both ligaments, may exist in varying degrees. In slight cases there is a tendency to subluxation backwards or forwards, which the patient may be able to produce or control at will. In the severe cases the leg cannot be used for standing or walking without constant risk of giving way at the knee. The lesion is always caused by a severe direct injury which may actually cause dislocation of the knee. In such a case, or wherever the gravity of the injury is suspected, the leg should be kept with the knee fixed in full extension for at least six months, by means of a long leather splint provided with side irons fixed to the heel but jointed at the ankle. Under such treatment there is a good prospect of the torn ligaments uniting without further trouble. But unfortunately the gravity of the injury is often not recognized at the time, and after a short period of rest the patient is allowed to use his leg. Then, when he has regained some degree of freedom, the tibia slips forward or backward and the patient is thrown to the ground. At this stage it is probably useless to expect any recovery, because the ends of the torn ligament have retracted and become atrophied. The choice will then lie between the constant use of a knee-cage for walking, or a reconstructive operation. The only satisfactory type of splint will be one which is moulded on to the whole thigh and leg, with side irons jointed accurately opposite the condyles of the femur and the malleoli of the ankle and fixed into the heel of the boot. All short cage-splints extending six inches above and below the joint are inefficient, because they do not get a proper purchase upon the limb, and also because the hinges of the side bars do not retain a proper position exactly opposite the condyles.

The reconstructive operation consists in replacing the ruptured ligament by a band of fascia or by a tendon. Thus the anterior crucial may be replaced by a strip of the

liotibial band, cut 8 in. above the knee, its lower attachment remaining intact. It is passed through holes bored in the external condyle of the femur and the head of the tibia in such a way as to lie in the same position as that of the normal ligament. Similarly, the posterior crucial may be replaced by the tendons of the gracilis and semitendinosus muscles, cut above, brought through the back of the joint, and out through a hole in the internal condyle.* *E. W. Hey Groves.*

KNOCK-KNEE.—In this condition there is a deformity at or near the knee-joint, the result of which is that the distal part of the limb is displaced from the middle line of the body. Between the line of the femur and the line of the tibia an angle exists externally, and if this angle be less than 165° there is a condition of knock-knee.

Knock-knee may be due to interference with growth of an epiphysis (femur or tibia) at the outer side; it may be due to mal-union of a fracture; it may be due to shortening of the biceps in a case of infantile paralysis; but the vast majority of cases are due to rickets in children, and to static conditions in adolescents.

Treatment.—Practically this resolves itself into the treatment (1) in children, (2) in adolescents. It may be noted that the deformity is usually, when bony, in the lower end of the femur, and disappears when the knee is flexed. Even if the deformity is mainly at the upper end of the tibia and does not disappear with flexion, many surgeons, should operative treatment be necessary, advocate osteotomy at the lower end of the femur. I have had one case of severe hæmorrhage after osteotomy of the upper end of the tibia.

1. *Treatment in Children.*—Decide first of all whether the rickets is (*a*) active, or (*b*) inactive.

a. If the child be anæmic, liable to catarrhs, sweating at night on the pillow, etc., then it must be kept as far as possible in the open air and in sunshine. Cod-liver oil is the sovereign remedy for rickets, being much more readily digested than cream. The child must not be allowed to sit up, to crawl, or to stand or walk. It is best kept in a box-splint, this being removed night and morning for the nurse to give gentle manual correction of the knock-knees and gently rub the limbs to maintain nutrition. The deformity is due to the softness of the bones and the laxity of the ligaments. It will take probably two months for the symptoms of active rickets to disappear, when the child can be gradually allowed to sit up, stand up, and finally walk with the inner borders of its shoes wedged up by one-eighth of an inch of leather. The cod-liver oil must be continued for months.

b. If there is no sign of active rickets, the treatment depends on the amount of deformity. Stand the child up with the patellæ looking straight forward, the knees completely extended, and the feet parallel. If the distance between the malleoli be one inch, cod-liver oil internally and wedging up the inner borders of the shoes may readily effect a cure; but it is unwise to postpone splints too long; it is most unwise to do nothing. It is perfectly true some of these rickety deformities disappear in a marvellous way; but most of them progress in default of treatment, and we can never pick out the children who would undergo spontaneous cure.

Should the separation between the malleoli be less than four inches, the application of splints will effect a cure, cod-liver oil being given at the same time. All splints pointed at the knee are useless. I prefer plain padded wooden splints reaching from the trochanters to the malleoli. There seems to me no necessity to take the child off its feet in the absence of active rickets, and it is all the better for the exercise. The splints are connected by a strap of webbing posteriorly across the sacrum, and the nurse who applies them night and morning must be shown the necessity of adjusting them (i) with the knees completely extended, and (ii) with the patellæ looking straight forward. If applied with the knees a bit flexed, or with the limb rotated externally, the effect of the splint is very largely lost. When they are removed night and morning, the opportunity is taken to massage the limbs gently. In addition to the wearing of splints, the shoes are wedged up on the inner side.

The splints must be worn day and night till the limb is straight. They must be

* For details of these reconstructive operations, see the article on "Rupture of the Crucial Ligaments" by Hey Groves in the *British Journal of Surgery*, July, 1920.

worn during the day, not only till the limb is straight, but till all lateral movement at the knee has disappeared. They can then be removed gradually, but the special shoes must be worn for months afterwards.

Should the separation between the malleoli be between four and six inches, these splints will probably effect a cure, especially if the deformity be much less when the child is lying down. Failing a cure by splints, the alternative is operation.

Should the separation between the malleoli be more than six inches, operation will effect a rapid cure with very little risk, and should be recommended. The operation will be Macewen's osteotomy, to be described later.

2. *Treatment in Adolescents.*—The cause here is that the patient has depended on his ligaments alone for support, his muscles being incapable of sustained effort. The stretching of the ligaments is followed by changes in the bones, especially at the lower end of the femur. The new bone is on the shaft side of the epiphyseal line, this latter being parallel to the line of the knee-joint. The adductor tubercle marks the inner end of the epiphyseal line, and it is this line which has to be avoided in operative treatment.

If the separation between the malleoli, with the patient supine, is more than six inches in a bilateral case, operation should be advised. A four-inch separation can be cured by splints as in a child. A separation of between four and six inches must be treated on its merits ; if the patient can continue light work in splints, and so secure better nourishment, it is justifiable to try splints ; but these must reach from the trochanter to the malleolus, the knee must be extended, and the patella must look straight ahead.

Macewen's osteotomy is superior to any other operation for this condition in its simplicity, its safety, and its results. The incision is at the inner side, half an inch in front of the adductor tubercle and half an inch above the upper margin of the external condyle. About three-fourths of the bone is divided with the osteotome, and the remainder snapped by correction of the deformity. The limb is put up in splints, and ten days later is put in plaster with a final correction. If the ligaments were very slack before the operation, the plaster is applied with the limb a bit bow-legged. The patient may walk with a Thomas's caliper splint at the end of two months, and with no support. if lateral movement has disappeared, at the end of six months. Personally I place these patients on cod-liver oil as in rachitic cases.

Robert Milne.

KRAUROSIS VULVÆ.—For the treatment of this condition, see the article on Pruritus Vulvæ. If milder measures fail, it may be necessary to remove all the affected skin and mucous membrane. An additional argument in favour of operation may be found in the fact that carcinoma sometimes supervenes on this condition.

H. Russell Andrews.

LACHRYMAL APPARATUS, DISEASES OF.

Acute Inflammation of the Lachrymal Gland (Dacryo-adenitis).—It has only recently become recognized that this disease is not very uncommon. The condition has to be distinguished from periostitis of the orbital margin in this region and a suppurating Meibomian cyst near the external canthus. The symptoms are acute : great swelling of the lids and conjunctiva, tenderness, with brawny thickening over the lachrymal gland, enlargement of the pre-auricular gland, pain, and general febrile symptoms.

Hot fomentations, leeches to the temple, purgation, and antiphlogistic treatment will generally subdue the inflammation in a few days. Should, however, the gland suppurate, it may be necessary to divide the external canthus with a pair of scissors (canthotomy), and, having everted the upper lid, incise the abscess. This, however, is seldom necessary, for the abscess almost invariably bursts into the conjunctival sac, when the symptoms are at once relieved. Rarely, the pus escapes into the orbital tissues, giving rise to an acute orbital cellulitis ; or through the skin, when a troublesome fistula may result.

Lachrymation and Epiphora.—These terms, both used to imply an overflow of tears, have a widely different significance.

Lachrymation implies an excessive secretion of tears, which flow over on to the cheek owing to the inability of the normal excretory passages to cope with the increased flow. The treatment of this symptom is therefore described under the various injuries and diseases of the eye which cause a reflex hypersecretion of the lachrymal gland.

Epiphora, on the other hand, signifies an overflow of tears brought about by some imperfection in the excretory passages (puncta, canaliculi, lachrymal sac, or nasal duct).

In the treatment of epiphora we may first classify the conditions which give rise to this symptom : (1) *Stenosis or eversion of the punctum* (including ectropion). (2) *Obstruction of the canaliculus.* (3) *Obstruction of the nasal duct.*

1. *Stenosis or Eversion of the Punctum* (including ectropion).—This most frequently results from chronic ciliary blepharitis. After dilatation with a Lang's dilator, the canaliculus must be slit up for about three millimetres. The inner wall is picked up with a fine pair of forceps, and a quadrilateral portion is excised with scissors. (For method of dilating the punctum, and slitting the canaliculus, *see* CHRONIC DACRYOCYSTITIS, *infra.*) Rarely we meet with cases of congenital occlusion of the punctum resulting from a membranous pellicle—it is only necessary in such cases to rupture the membrane with the dilator. Eversion of the lower punctum, so frequently met with in old people, and resulting from loss of tone in the orbicularis muscle, is one of the commonest causes of epiphora, a very slight displacement being sufficient to give rise to this symptom in a distressing degree. For milder cases an astringent application, e.g., zinc sulphate drops, 1 gr. to the ounce, or painting the conjunctiva with 2 per cent silver nitrate solution twice a week, may be all that is necessary. Should epiphora continue, the canaliculus should be divided, and a quadrilateral portion of the inner lip excised. In facial paralysis, eversion of the punctum from sagging of the lower lid, with distressing epiphora, is a prominent symptom. If the paralysis is permanent, it becomes necessary to slit up the lower canaliculus to make a gutter for the reception of the tears, and in some cases to shorten the lower lid by an appropriate operation.

2. *Obstruction of the Canaliculus.*—The lower canaliculus may become blocked by cicatricial contraction, or rarely by a foreign body, e.g., eye-lash or concretion.

Cicatricial contraction is often extremely intractable and is usually better left alone. In some cases a Stilling's knife can be directed into the sac, and the stricture divided ; the passage may then be kept open by wearing a style for two or three months. Foreign bodies must be removed, if possible through the dilated punctum, but failing this, by a small incision in the long axis of the canaliculus.

3. *Obstruction of Nasal Duct* (*see* ACUTE and CHRONIC DACRYOCYSTITIS, *infra*).

Acute Dacryocystitis.—Acute inflammation of the lachrymal sac (acute dacryocystitis) most commonly follows a chronic obstruction in the nasal duct, as shown by the frequent history of long-standing epiphora. Occasionally it may result from a syphilitic or tuberculous periostitis, very rarely from secondary infection from the conjunctival sac.

In the earliest stages, continuous hot fomentations, purgation, and antiphlogistic treatment will sometimes cut short the attack. If, however, the symptoms do not subside in a few days, an anæsthetic (nitrous oxide or ethyl chloride) must be given, and an incision, one inch in length, made through the thickened tissues right down to the sac. The wound should then be packed with a narrow strip of gauze, and kept open until the discharge has ceased, fomentations being applied and continued until all the swelling has subsided. Later, the case should be treated as in chronic dacryocystitis.

Chronic Dacryocystitis.—In this disease, which commonly results from a stricture of the nasal duct, the lachrymal sac becomes distended with muco-pus, forming a swelling immediately below the tendo oculi (mucocele). The disease is one of the most intractable with which we have to deal, and its successful treatment necessitates the exercise of great patience on the part of the sufferer and the surgeon. It may be laid down as a general rule in the treatment of this condition that the simpler methods should be exhausted before we resort to cutting instruments or the passage of probes.

The different methods which we may find it necessary to adopt should be carried out in the following order : (1) Syringing ; (2) Passage of probes ; (3) Wearing a style ; (4) Excision of the lachrymal sac.

It should be mentioned that West's operation (viz., the removal of the bony wall on the inside of the lachrymal sac, and establishing a permanent opening from the sac into the nose) has been performed with success in some cases.

We commence the treatment by ascertaining if the lachrymal passages are permeable to fluids, and to do this we must first dilate the lower punctum.

Method of Dilating the Lower Punctum.—After anæsthetizing with two or three drops

of a 2 per cent solution of cocaine instilled into the conjunctival sac, followed by a few crystals of cocaine on the punctum itself, the lower lid is slightly everted and at the same time rendered tense by being gently drawn downwards and outwards. A Lang's canaliculus dilator is then passed in a vertical direction until the point is well engaged in the lower punctum, when it is turned through a right angle and made to pass horizontally until the opening is sufficiently enlarged. Having thus dilated the punctum, the nozzle of the lachrymal syringe filled with boracic lotion is inserted and passed along the canaliculus into the lachrymal sac. If, on gently emptying the syringe, the fluid does not regurgitate through the upper or lower punctum, but passes freely into the patient's nose and throat we may hope to cure such a case without either probing or slitting the canaliculus.

The sac should be freely syringed every second day with boracic lotion, 10 gr. to the ounce, followed by astringent lotion, e.g., zinc sulphate, 2 gr. to the ounce, or protargol 25 gr. to the ounce. After syringing with protargol it is always well to wash out the sac with boracic lotion before the patient is allowed to go. The patient should be directed to empty the sac frequently by pressure with the finger, and if there is any suspicion of rhinitis, a saline nasal douche should be used night and morning.

In the use of the lachrymal syringe, the greatest gentleness should be exercised, as too great force may lead to an extravasation of the septic fluids through the diseased wall of the sac, with disastrous results, e.g., orbital cellulitis and optic atrophy. It is a golden rule never to syringe immediately after probing.

Should we find it impossible to syringe fluids into the nose, the same treatment should be persevered with for two or three weeks, in the hope that the inflammation may subside, and the normal channels again become patent; but if at the end of that time we are still unsuccessful, an attempt must be made to dilate the stricture by means of probes.

If the lid is sufficiently lax, a small probe may often be passed down the nasal duct without dividing the canaliculus; but if any difficulty is experienced, either from rigidity of the lid, or in finding the passage, the outer two-thirds of the lower canaliculus should be divided before attempting to dilate the stricture.

Slitting the Canaliculus.—A drop of 2 per cent cocaine is instilled into the conjunctival sac, and a few crystals of solid cocaine are placed along the line of the proposed incision. The surgeon stands behind the patient, who is seated in a chair with the head thrown well back and comfortably supported. Usually the lower canaliculus is the one selected, as being more convenient for subsequent probing or for wearing a style. The lower lid is everted and drawn downwards and outwards in order to make the parts tense. The punctum is now dilated, and a Tweedy's canaliculus knife, with the cutting edge directed upwards and backwards, is passed in the same way as the dilator (*vide supra*) along the canaliculus, until the point is distinctly felt to impinge against the lachrymal bone. The knife is now raised until the canaliculus is divided for the outer two-thirds of its extent. It is most important that the incision should lie on the conjunctival surface and not on the free border of the lid, as the latter renders satisfactory drainage impossible. After the little operation is completed, the lips of the wound will speedily unite unless special care is taken to keep them apart for a few days by the passage of a small probe, or the same result may be better obtained by snipping off a small quadrilateral portion of the posterior lip of the incision.

Passing a Probe.—The position of the patient and surgeon are the same as for opening the canaliculus. The smaller sizes of Couper's bulbous-pointed probes are the most generally useful, and, to alleviate the pain and facilitate the passage of the probe, its end should be well coated with a 2 per cent cocaine ointment. With the probe held lightly between the finger and thumb, it is passed horizontally along the opened canaliculus and into the sac until it is *distinctly felt to strike the lachrymal bone* and there is no dragging of the lid. It is most important that careful attention should be paid to this detail; otherwise a false passage will almost certainly result. Keeping the point of the probe pressed gently against the lachrymal bone, the hand is raised until the probe points downwards and slightly outwards and backwards. Gentle pressure is then exerted, when the probe will be felt to pass down the nasal duct. The amount of force to be used must depend to a great extent upon the experience of the surgeon, and it is only necessary to point out how extremely easy it is to make a false passage. Having passed a small probe (No. $\frac{1}{2}$ or 1), we proceed at intervals of a few days to dilate the stricture with larger probes, but it is

seldom necessary to go higher than a No. 4. This probe should be passed once a week for some months, until regurgitation and epiphora have entirely ceased. On no account should probing be immediately followed by syringing, or disastrous results may ensue, e.g., orbital cellulitis.

Continuous dilatation of the stricture by wearing a style, a form of treatment much in favour with some surgeons, should be preferred to probing under the following conditions: (1) When probing is too painful; (2) When regular attendance is impossible; (3) When the stricture again contracts rapidly after dilating.

Unfortunately there are many cases of chronic dacryocystitis in which conservative treatment either fails or becomes impossible from the demands upon the patient's time. In such cases we must excise the lachrymal sac. This operation, which until recent years has been done but little in England, gives the most admirable results, and contrary to what might be expected, the resulting epiphora is slight, and frequently only noticeable in a cold wind.

Excision of the Lachrymal Sac is indicated in the following conditions: (1) When the sac is distended; (2) When conservative treatment has failed; (3) When a spreading ulcer of the cornea associated with a mucocele progresses in spite of the ordinary treatment; (4) When an urgent intra-ocular operation is indicated, e.g., glaucoma. In the less urgent operations, e.g., cataract extraction, it is generally wiser to excise the sac some weeks before doing the extraction; (5) When the sac is tuberculous; (6) When there is necrosis of bone.

Congenital Lachrymal Obstruction.—Not infrequently we meet with cases of lachrymal obstruction associated with dacryocystitis (acute or chronic) in the newly-born, resulting from the nasal duct being blocked by epithelial débris, or imperfect canalization of the nasal duct. These cases, as a rule, can be cured by the passage of a No. 1 Couper's probe down the duct through the dilated punctum, followed by frequent bathing with astringent lotion, and regular emptying of the sac four or five times a day by pressure over the internal canthus.

Fistula of Lachrymal Sac.—This condition is a not infrequent sequela of acute dacryocystitis. The treatment consists in excising the fistulous tract and restoring the patency of the lachrymo-nasal passage, or excising the sac and the fistulous tract at the same time.

Ilbert Hancock.
(*Revised by W. T. Lister.*)

LARYNGEAL OBSTRUCTION.—The causes of laryngeal obstruction from intrinsic changes in the larynx may be broadly classified into (1) Diphtheritic; (2) Non-diphtheritic affections. In the latter group are included acute simple laryngitis, syphilitic and tuberculous laryngitis, acute purulent perichondritis, œdema of the larynx, neoplasms of the larynx, and the impaction of foreign bodies.

1. **Diphtheritic Laryngitis.**—In its *primary* form this is an exceedingly rare disorder, and indeed the condition can be absolutely identified only by obtaining a culture of the Klebs-Loeffler bacillus from the interior of the larynx. *Secondary* diphtheritic laryngitis is easily identified by finding evidence of the primary infection in the pharynx or the nose.

When the swelling in the larynx is so great as seriously to impede the entry and egress of air, the air-passage must be kept patent by artificial means. (This is merely an adjunct to the routine treatment of DIPHTHERIA, which see.) The two means at our disposal are intubation and tracheotomy. When the child can be kept continuously under the immediate supervision of a medical man, the former method has many advantages over the latter. Intubation can be performed quite soon after the onset of obstructive dyspnœa, since the risk of injuring the larynx is exceedingly slight. No anæsthetic is required. The formation of an open wound in the neck, with the associated risk of infection, is entirely avoided. The inspired air is warmed and filtered by passing through the normal channels for respiration, which is not the case after the performance of tracheotomy. Lastly, experience has shown that in cases of diphtheritic laryngitis the mortality is less after intubation than after tracheotomy. The great disadvantage of this method is the need for the continual presence of a medical man, since the replacing of a tube that has been coughed out cannot as a rule be performed by a nurse, and death may ensue from suffocation before help can be obtained. It is thus a mode of treatment that must be limited almost entirely to cases in a hospital. (*See also* DIPHTHERIA.)

If the dyspnœa is not relieved after intubation has been performed, then *tracheotomy* must be resorted to. The directions for performing this as a leisurely surgical operation are too well known to need repetition, and may be found in any text-book. The opportunities for performing it under such conditions are, however, far fewer than those for an emergency operation. Under such conditions, as a rule, it has to be performed with great rapidity in cases of extreme urgency, and the following method will be found to be a safe and reliable one.

A sharp scalpel and a pair of Spencer Wells' forceps are the instruments required. Place the child in the recumbent position, with a sand-bag under its shoulders, so that the head and neck fall backwards, with the skin more or less tightly stretched over the the front of the neck. Identify the lower border of the cricoid cartilage by running the finger up the middle line of the neck. With the index finger and thumb of the left hand grasp the trachea firmly on either side immediately below this point, and do not release it until air is entering freely through an opening in its anterior wall. With the trachea thus fixed, cut boldly from above downwards in the centre of the space between the thumb and finger. The anterior surface of the trachea is thus rapidly exposed. Then grasp the blade of the scalpel near to the point and incise the trachea freely from below upwards. Insert the tip of the forceps into the opened trachea and separate the blades. By this means the opening is made to gape, and the trachea can be steadied in the wound. Not until this has been done should the hold on the trachea by the left hand be released. A piece of ordinary rubber drainage tube can be inserted as a temporary substitute for a proper tracheotomy tube. In making the incision in the soft parts of the neck with the trachea thus fixed there is no necessity—and frequently no time—to search for the interval between the infrahyoid muscles, to identify the isthmus of the thyroid gland, or to avoid the distended veins which are described as a likely source of danger. Hæmorrhage, as a rule, is unfortunately only too scanty, since a free flow of blood would be a welcome relief to a badly distended right side of the heart. Moreover, the entry of blood into the trachea can be averted easily by pressing back the soft tissues on both sides of the wound with the thumb and finger at the same time as the opening into the trachea is mopped by wool. The tube must be kept clean by spraying at short intervals with an alkaline lotion, and when necessary the inner tube must be removed for a more thorough cleansing. Feathers or other bodies must never be thrust down a tube to clean it. The outer silver tube should be changed at the end of twenty-four hours after operation, and a rubber tube may be substituted for a silver one within about three days.

2. **Non-diphtheritic Affections.**—Either or both of the foregoing methods of treatment may be necessary in cases of *non-diphtheritic origin* after other measures have failed.

In *acute simple laryngitis* the bed must be drawn up alongside a window widely open at the bottom. The child must be covered by blankets, and the head and hands protected by a warm cap and gloves. Hot-water bottles must be kept in the bed. Glycerin-of-belladonna fomentations or ice-bags should be applied to the front of the neck, and plenty of hot drinks administered. By these means the maximum amount of pure air is ensured to the child, and in many cases after a short time the patient falls into a quiet sleep. Preliminary measures of treatment have so frequently been directed towards keeping the child in a stuffy room, and thereby directly aggravating the symptoms caused by an imperfect supply of oxygen, that the adoption of the above methods often affords instantaneous and permanent relief. But when these measures fail after a short trial only, intubation must be performed. (*See also* CROUP.)

In *œdema of the glottis* as a secondary condition in renal disease, or following a scald or burn, intubation is useless on account of the œdematous tissue which overlaps the opening of the tube, and because of the extensive ulceration that the tube causes in these cases. Tracheotomy must be performed at once. But recurrent attacks of laryngeal obstruction due to œdema of the aryteno-epiglottic folds may occur in subjects otherwise healthy. The œdema is part of a generalized congestion of the mucosa of the pharynx in their immediate neighbourhood, due to the presence of septic embedded tonsils. No relief is afforded by intubation, and examination by Brünings' tubes shows that the upper end of the intubation tube is occluded by the swollen aryteno-epiglottic folds. Immediate removal of the tonsils by dissection affords instant relief and effects a permanent cure.

If this is not done, tracheotomy must be performed—a very undesirable alternative, as it treats only the symptom of obstructed respiration without affecting the cause of it.

New growths of a simple nature, and *foreign bodies*, must be removed by intralaryngeal operations, if possible. A solitary papilloma lends itself well to this form of treatment, but multiple papillomata tend to recur so frequently after intralaryngeal removal that the writer has finally abandoned this method. For multiple cases a thyrotomy should be performed and then the whole of the papilloma-bearing area removed by dissection. The wound in the larynx and neck is then closed in the usual manner, and a large-sized intubation tube, well greased with unguentum iodoformi or any other simple ointment, is introduced into the larynx through the mouth. This should be removed for purposes of cleaning at the end of forty-eight hours, and then replaced. Daily removal should then be began, but the tube must be used for about a month or six weeks. At the end of that time the interior of the larynx should be completely healed, whilst any tendency to narrowing of the larynx by the formation of bands or adhesions has been prevented by the presence of the tube. A final inspection with Brünings' tubes will exclude any recurrence of the growth having occurred. Treated in such a way, these otherwise troublesome cases do well, and the power of speech appears to be very slightly impaired after about a year's time from the date of operation. Other methods of treatment that have recently been introduced with advantage are the direct application of radium to the growth, and 'desiccation' by means of high-frequency currents.

The detection of foreign bodies may be aided by *x* rays. Laryngoscopic examination should be attempted in all cases, and under a general anæsthetic when necessary. But by far the most valuable method of examination in all doubtful cases—and the only possible one in children—is the direct-vision method by the aid of Brünings' tubes. For this a general anæsthetic is advisable, and in children is a necessity.

In frequently recurring attacks of laryngeal obstruction without any obvious cause, *syphilis* should be suspected and antisyphilitic remedies used. In advanced cases of *tuberculosis* with secondary involvement of the larynx, tracheotomy may have to be performed for the relief of obstruction. (*See also* LARYNGITIS, and FOREIGN BODIES IN THE AIR-PASSAGES.)

George E. Waugh.

LARYNGEAL STRIDOR (Congenital).—Although in most cases due to malformation of the epiglottis, which causes obstruction to respiration, this complaint may sometimes depend on want of co-ordination between the muscles which close the glottis and those which are otherwise concerned in respiration. Whether the defect is of the higher cortical centres, or of those in the bulb, is unknown. In many cases the affection subsides towards the end of the second year. It is, however, persistent in some, but these are usually the subjects of congenital spasticity or other forms of birth-palsy. Special treatment, unless nasal obstruction by adenoids or catarrh be present, is unnecessary. *Leonard G. Guthrie.*

LARYNGISMUS IN CHILDHOOD (Laryngospasm, Laryngismus Stridulus). This is commonly associated with tetany, convulsions, and rickets (q.v.). Intermittent spasm of the glottis (laryngismus) should be distinguished from congenital stridor, from the various forms of laryngitis, from dyspnœa due to laryngeal obstruction by a foreign body, and from dyspnœa dependent upon intrathoracic causes. Laryngismus occurs under excitement, on suddenly waking, and on exposure to cold draughts. Hoarseness, continuous stridor, clanging cough, and pyrexia are absent in uncomplicated cases.

TREATMENT.—For the immediate relief of laryngismus, sponges wrung out of hot water should be applied to the front of the neck, and the chin should be drawn forwards. By the time a hot bath can be prepared, the spasm is usually over, or the infant is dead. But death from simple laryngismus is rare. When fatal, it is usually in association with enlargement of the thymus and the so-called 'status lymphaticus'. Dangerous symptoms are sudden blanching, cessation of struggling and attempts to breathe, and wide dilatation of pupils. On their appearance, artificial respiration should be at once employed, and parents and nurses should be instructed in this method of restoration in all cases of laryngismus, in case necessity for its use should arise. Children in these dangerous conditions are too often hurried to the nearest chemist, doctor, or hospital, and are dead by the time they arrive. During artificial respiration, smelling salts may

be held under the nostrils, but not whilst struggles for breath continue, for ammonia ma increase spasm.

Very few cases of laryngismus resist treatment by suitable diet, and by castor o suspended in mucilage, with rhubarb and bromide of potassium. Belladonna or chlora hydrate may be added, especially if convulsions have occurred. *Leonard G. Guthrie*

LARYNGITIS.—(*See also* CROUP ; DIPHTHERIA ; LARYNGEAL OBSTRUCTION ; MEASLES.

1. **Acute Laryngitis.**—Primary acute laryngitis when it occurs in the adult is usuall met with in males who have been indulging too freely in alcohol and tobacco, or over using the voice. It also occurs in the course of the acute and infectious diseases, but mor frequently in influenza, when the patient has persisted in using his voice during the attack

TREATMENT.—Without treatment the attack will probably pass off in a few days and may leave no ill-effects behind, or it may become chronic. It is generally those who have to use their voices professionally who seek for advice, and often with the earnest request that they may be cured at once in order to fulfil an engagement. The risk of injuring the voice permanently in such cases is so great that it is best not to undertake them at all unless the patients will give up the engagement, for three or four days' complete rest of the voice is the essential element in treatment.

The patient should be put to bed, and given a mercurial purge. The room should be well ventilated, and, if the weather be cold, a fire lighted. If the patient complain of cold, a Shetland shawl should be put over the head. Alcohol and tobacco should be strictly forbidden.

Internally, acetylsalicylic acid (10 gr.) or pyramidon salicylate may be given thrice daily, especially if there be any fever; but if the temperature be very high, as occasionally happens in very nervous subjects, drop doses of tincture of aconite may be given every hour until it falls to 100°.

Liquor ammoniæ acetatis in ½-oz. doses combined with 10-min. doses of spiritus ætheris nitrosi and 10 gr. of potassium bicarbonatis may be given every two hours, followed by hot weak tea or large draughts of hot barley-water, until perspiration occurs. Vapour in the form of 1 teaspoonful tinctura benzoini co. to a pint of hot water should be inhaled at a temperature of 150 to 140° for ten minutes three or four times a day. The following prescription the writer has found very efficacious :—

℞	Sodii Bicarbonatis Sodii Benzoatis Sodii Biboratis	āā ℥ij	Acidi Carbolici Puri Glycerini Aquæ Destillatæ	gr xv ℥iss q.s. ad ℥viij

One part of this should be mixed with one of cold water, and put into the tumbler of a Siegle's steam spray. The spray must be so arranged on a table or chest of drawers that the patient's mouth is exactly opposite it and on the same level. If necessary the patient can be put on a chair and raised with books or pillows.

The patient should then put a large bath-towel round his neck and shoulders, and, taking hold of his tongue with one corner of the towel, pull it well out whilst sitting so that the funnel of the spray is not more than two inches from his open mouth. He should then, while keeping the tongue well out, inhale the vapour deeply into his lungs for five or ten minutes at a time—including also the nose, when there is catarrh of that organ—and then get back to bed and roll his head up in the shawl. This can be repeated three or four times a day.

When there is much pain, a mustard leaf may relieve it. It should be applied as follows : Wet it in hot water, cut it in half lengthways, and apply one half to the larynx just below the chin, and the other half below that, so that it forms a long narrow strip down the front of the neck. The leaf should be allowed to remain on for twenty minutes by the clock. On removing it, a little vaseline should be rubbed over the reddened surface, and some cotton-wool applied to it and kept on by a bandage.

A carbolic-acid compress will also be found very soothing. A doubled piece of lint about three inches wide, and long enough to go half round the neck, should be wetted with a solution of carbolic acid (1–60). This should be applied to the neck and covered with a piece of guttapercha tissue large enough to extend at least two inches beyond it on all sides. This should be kept on by applying cotton-wool and a bandage. Guttapercha

issue is preferable to jaconet or oil-silk, as it clings to the skin better, and prevents the vaporation of the carbolic acid. This can be kept on for twelve hours and then renewed.

A compress of antiphlogistine sometimes relieves the pain better than anything else, ut to be effective it must be properly applied, as follows: take a piece of lint ighteen inches long and broad enough to extend from the chin to the collar-bones; pread the antiphlogistine on it very hot, and about an inch thick, sufficient to cover the eck from ear to ear and from chin to sternum; apply it as hot as can be borne, then put n a thick layer of cotton-wool, and keep it tight with a bandage; renew again at the end f twelve hours.

In patients with a rheumatic diathesis, ionic medication with 2 per cent salicylate f soda is useful both in relieving the pain and removing the hoarseness.

From the very beginning it is of the utmost help to have the neck properly massaged or twenty minutes night and morning, and the use of an electric vibrator, such as Barker's, vill be found a great adjuvant to the treatment, and will greatly help to prevent the disease ecoming chronic, i.e., if the voice has been rested during the attack.

It is best not to begin tonics until the acute symptoms have passed off, and then the ollowing mixture may be given:—

℞ Ferri et Ammonii Citratis	ʒiij	Extracti Glycyrrhizæ	ʒj
Ammonii Chloridi	ʒiv	Infusi Senegæ	q.s. ad ʒvj
Liquoris Strychninæ	ʒj		

One-twelfth part thrice daily after meals in a wineglassful of water.

When the patient is fit to go out, the hot inhalations should be stopped, and the ollowing spray be used four or five times a day:—

℞ Mentholis	gr xij	Olei Gaultheriæ	āā ♏ij
Camphoræ	gr vj	Olei Cinnamomi	♏iv
Olei Eucalypti		Olei Adepsin	q.s. ad ʒj

To be sprayed into the nose and throat four or five times a day by means of a De Vilbiss spray.

2. **Acute Œdematous Laryngitis,** when it occurs primarily, may be set up by the ing of a wasp, the impaction of foreign bodies, or the drinking of corrosive or scalding uids. Sometimes it occurs in patients of a well-marked rheumatic diathesis without any pparent exciting cause. It may also be secondary to septic inflammation of the pharynx om infection by some pyogenic organism, from septic stumps or pyorrhœa.

Treatment must be based on the cause. In a great many cases the feeling of oking, even when there is not much œdema, frightens the patient so much that he will ot allow any examination to be made. In that case large doses of bromide of potassium ould be administered, and, if necessary, ¼ gr. of morphia should be injected, and the roat sprayed with a mixture of 20 per cent cocaine and 1–2000 adrenalin. A large dose f calomel or a blue pill should be given as soon as possible, and, if there be any rheumatic istory, salicylates in full doses.

Locally, the œdema must be reduced by scarifying the inflamed tissue by means of ackenzie's laryngeal knife; this, however, must not be done in a haphazard way, but y means of the laryngeal mirror. If the operator be not expert in its use, it would be dvisable for him to perform tracheotomy, or laryngotomy, or intubation. (*See* Laryngeal bstruction and Diphtheria.)

3. **Chronic Catarrhal Laryngitis.**—In most cases this is due to an acute attack hich has not completely resolved, but it may result from an extension of disease downards from the nose, or upwards from the trachea. In both cases there is constant cough om an endeavour to get rid of mucus. It occurs frequently in gouty, rheumatic, and yspeptic subjects, and in those who suffer from liver complaints or uterine troubles. It also a concomitant of syphilis, tuberculosis, lupus, and some cases of paralysis, and a equent result of gassing.

Treatment will depend to a great extent upon the cause, but in every case rest of ne voice is essential to success. This is the great difficulty in curing professional voicesers, to whom such vocal rest is often impossible. The use of alcohol and tobacco should e forbidden. For those who can afford it—especially if gouty or rheumatic diathesis e present—it is best to begin treatment by a course at Aix-les-Bains, Mont Dore, or

Salsomaggiore, where the local treatment is thoroughly carried out. In no English spa (that the writer knows of) is the local treatment so well done, however good the general management of the cases may be. At home, the treatment recommended under acute laryngitis must be persevered with, but in the writer's experience the greatest good is obtained from skilful massage of the neck and larynx combined with massage, vibration and ionization. In most cases of professional voice-users, the voice has been badly produced from the beginning and is extremely 'breathy': it is sometimes very difficult to get patients out of their old habits, which is so necessary in these cases before they can learn to produce their voice with a wide-open pharynx, and therefore without 'pinching' or 'squeezing'.

4. **Hypertrophic Laryngitis.**—This is only a more marked form of the condition just considered. Treatment is not satisfactory, but when the hypertrophy is situated in the interarytenoid space, it may sometimes be of advantage to pinch out a piece of the hypertrophied mucous membrane with forceps. Ionization may also be tried.

5. **Atrophic Laryngitis** is generally associated with the same condition in the nose and nasopharynx, and should be treated on the same lines as these.

6. **Subglottic Laryngitis.**—Owing to the swelling taking place below the glottis, and therefore in a restricted space, this is a more dangerous form than any of the others previously mentioned. If the case is at all severe it should be kept under constant supervision, because at any time tracheotomy may be necessary.

7. **Chorditis Tuberosa.**—This is generally called 'singer's nodules', but it more often occurs in teachers than in singers. It is in all cases due to a wrong method of voice-production, and it occurs more frequently in females than in males, because the former are more liable to anæmia, and so force their voice by using it when the larynx is anæmic, and because they have the smallest children to teach and have to speak in a higher pitch in the endeavour to make their voice heard over the din.

In all cases *absolute* rest of the voice must be secured, and if the nodule or nodules be not large this may be sufficient, combined with cold astringent sprays. But if the nodules be large, the quickest way to get rid of them is by removal with forceps, either by the indirect or by the direct method, which of course must be very cautiously done, especially in the case of a singer.

The 'coup de glotte' has often been supposed to be the cause of the formation of these nodules, but it is only the case when the 'coupe de glotte' is improperly carried out, and when it is combined with abdominal or forced diaphragmatic breathing.

George C. Cathcart.

LARYNGITIS, CATARRHAL.—(*See* Croup.)

LARYNX, FOREIGN BODIES IN.—(*See* Foreign Bodies in the Air-passages and Œsophagus.)

LARYNX, MALIGNANT DISEASE OF.—Malignant growths in the larynx are nearly always squamous epithelioma, and their treatment depends chiefly on their situation. An intrinsic growth is one wholly within the larynx, that is, involving either the ventricular bands, the vocal cords, or the parts below. An extrinsic growth is one involving the epiglottis, the ary-epiglottic folds, or the arytenoids. Intrinsic growths grow slowly, and do not infect the lymphatic glands until very late. Extrinsic growths are inclined to grow rapidly, and the glands are involved, often on both sides of the neck, almost from the commencement.

Intrinsic Growths.—These most commonly affect the vocal cords, and can usually be recognized at a very early stage. Whilst the growth remains intrinsic, shut up as it were in a cartilaginous box, the prospect of cure by free removal is most favourable, probably 70 to 80 per cent of cases remaining free from recurrence. Therefore operation may invariably be recommended, unless the patient's general condition is such as to preclude any severe surgical procedure. The operations to be considered are thyrotomy, or the more recently described *window resection* of the larynx, and total extirpation. Removal through the mouth is not to be recommended, although occasional successes have been reported. Removal of half the larynx must also be condemned; if a growth is too extensive for thyrotomy, total extirpation is best.

When a growth is limited to one vocal cord, or affects the anterior parts only of both cords, the smaller operation should be carried out. If the growth is so extensive that the soft parts of both sides of the larynx have to be cleared out, it is certain that laryngeal stenosis will follow, and better results will probably be obtained by complete extirpation. Thyrotomy consists in opening the larynx through a vertical incision in the median line of the neck extending from the hyoid bone to within a finger-breadth of the sternum. The thyroid and cricoid cartilages and the upper rings of the trachea are carefully exposed by dissection, and, all bleeding being arrested, the tracheal rings are divided and a tracheotomy tube inserted. The thyroid cartilage is divided in the median line with a saw or strong cutting pliers, and the interior of the larynx opened by dividing the cricothyroid membrane and extending the incision upwards through the soft parts precisely in the middle line. The windpipe immediately above the tracheotomy tube is packed firmly with a strip of gauze (properly secured to prevent it slipping down) to prevent blood entering the lungs. The two halves of the larynx are held apart by retractors, the growth carefully examined, and its nature and extent determined. If the growth be considered malignant and not sufficiently extensive to require total extirpation of the larynx, the next step is removal of the whole or greater part of the thyroid ala on the affected side. The saw should be applied horizontally just below and parallel to the upper border of the ala so as to leave this border intact, then the soft parts lining the ala are detached subperichondrially with a blunt dissector nearly to its posterior edge, and, finally, the square piece of cartilage thus defined is clipped away with strong cutting forceps. The removal of this cartilage greatly facilitates the subsequent steps of the operation by allowing free exposure of the diseased parts, and in no way impairs the subsequent results. When, as is generally the case, the surgeon has been able to ascertain the nature of the growth beforehand (by removal and microscopical examination of a portion), and by laryngoscopical examination knows that it is limited, there is no need to split the larynx at all. Instead of this, the square of thyroid cartilage, as above defined, should be at once removed. Where necessary, portions of the cricoid cartilage may be similarly removed. The larynx may now be opened in the median line or by dividing the cricothyroid membrane transversely. The latter is especially advisable when the anterior commissure is involved, as by so doing cutting into the growth itself can be avoided. The growth is now exposed by gradually enlarging the opening into the larynx, and removed in one piece with an ample margin of surrounding healthy tissue. All hæmorrhage is carefully arrested and all oozing stopped by allowing the tissues to become glazed by exposure to the air, or when necessary by applying a paste made by rubbing up powdered tannic acid with a few drops of water. The skin wound may be partially closed, and the tracheotomy tube removed at once, or better, left in for twenty-four hours. The patient should take nothing by the mouth for the first twenty-four hours, after which cautious attempts at drinking should be tried. The tracheotomy tube being removed, the patient should sit up, leaning slightly forward, and swallow sips of boiled water. If the water enters the larynx it will come out by the wound, and the attempt must be at once discontinued. If the patient swallows properly, other fluids such as milk, beef tea, and jellies may be given. It should always be carefully noticed if these give rise to coughing, or if they return by the wound in the neck. This may occur at any time during the first four or five days, although the patient may be able to swallow on the first day. If swallowing is impossible, the patient must be fed two or three times daily through a soft feeding tube, which can be passed gently through the mouth, and the patient encouraged to swallow it. Fluids can be given per rectum. After a few days the patient can usually swallow well, and healing is merely a matter of time.

As regards results, the operation is attended with no great danger, provided the patient is not too feeble and has no serious complications. The ultimate results as regards life are excellent when the operation is done in well-selected cases. When one vocal cord only is removed, after three or four months it becomes replaced by a fibrous band which looks and acts very like a fixed cord, and the patient can generally speak in a loud if somewhat hoarse voice. When parts of both cords are removed, more or less impairment of voice is inevitable. When the greater part of both cords has been removed, there may be so much subsequent stenosis that a permanent tracheotomy tube may be required.

Total Extirpation of the Larynx.—This operation should be practised in all cases of intrinsic disease when the growth is too extensive to be removed by the above method, and

also in many cases of extrinsic disease when the epiglottis or arytenoids or even adjacent parts of the pharynx are affected, provided a reasonable prospect of removing the entire disease exists. A vertical incision is made down the median line of the neck from the hyoid bone to just above the sternum, and transverse incisions from sternomastoid to sternomastoid at each end of the vertical incision. The quadrilateral flaps thus marked out are turned outwards. The anterior triangles of the neck are exposed, and if there are any enlarged glands a thorough dissection of the neck should be carried out. The larynx and upper rings of the trachea are exposed, the thyroid isthmus divided, and the trachea isolated. The trachea is now cut across transversely immediately below the larynx, and its end drawn forward into the lower transverse wound and fixed to the skin all round by a few sutures. This isolates the trachea from the wound, minimizes the risk of blood entering the lungs during the further stages of the operation, and allows the anæsthetic to be administered without interfering with the surgeon. The larynx is removed by dissection from below upwards, taking special pains not to button-hole the œsophagus. It is well to open the pharynx on the sound side first, so as to see the extent of the growth and ensure that as much of the surrounding healthy tissues as necessary is removed. A good deal of the pharynx may be cut away without impairing the success of the operation. The larynx being removed, there is a large gap left into the pharynx, and this must be closed very carefully by several layers of Lembert's sutures. The edges of the mucous membrane are carefully approximated by numerous close-set stitches of fine catgut. A second series of sutures is applied over this to unite the pharyngeal aponeurosis. All the divided muscles should then be sewn across so as to strengthen the new pharynx as much as possible. Finally, the skin wound should be closed by a few silkworm-gut sutures, a drainage tube inserted, and ordinary dressings applied.

The results of the operation are fairly good, the immediate mortality being perhaps 12 to 15 per cent. By isolating the trachea and stitching it to the skin, and by closing the opening into the pharynx, the chief danger of the operation, septic pneumonia, has been greatly reduced. The patient is able to swallow from the first, and if the wound heals well there will be no need to feed him except by the mouth. Sometimes the wound gives way slightly about the fourth or fifth day, in which case tube feeding must be adopted for a few days. Often the entire wound heals by first intention. After recovery the patient is able to take food in the usual way, but can never dispense with the tracheotomy tube. Although unable to phonate, patients acquire a method of whispering which can be heard distinctly at several feet. The prognosis with regard to recurrence depends entirely upon the extent of the disease, being very favourable in intrinsic and unfavourable in extrinsic growths.

Extrinsic Growths.—In growths primarily extrinsic, removal can only be undertaken in the earliest stages. A small growth in the arytenoid region may sometimes be removed by a lateral pharyngotomy. Total extirpation of the larynx with removal of a portion of the pharynx may also be successfully carried out in a few cases. It must be borne in mind that the glands are always infected, and must be freely removed at the same time. These operations are attended with a high fatality, and recurrence is the rule, although the patients may remain free from disease for two years or so.

In a few cases of growth of limited extent involving the epiglottis and surrounding parts, good results have been obtained by complete destruction of the growth by diathermy, with subsequent thorough removal of lymphatic glands. This operation is carried out by aid of suspension laryngoscopy, and is very much safer than any cutting method. The writer's first case, epithelioma of epiglottis spreading to glosso-epiglottic fossa and ary-epiglottic fold with affected glands on both sides of the neck, has remained free from recurrence over six years.

Where the patient's general condition, or the extent of the growth, forbids an attempt at cure, palliative measures must be adopted. These consist in relieving the pain and dysphagia by orthoform insufflations, morphia insufflations, or lozenges, and in most cases by giving opium internally in increasing doses (*see also* LARYNX, TUBERCULOSIS OF). As soon as dyspnœa arises, tracheotomy should be performed. The tube should be inserted as low down in the trachea as possible to diminish the likelihood of the tracheotomy wound becoming involved in the growth. In rare cases gastrostomy may also be advisable.

H. Lambert Lack

LARYNX, TUBERCULOSIS OF (Laryngeal Phthisis).—In treating tuberculosis of the larynx it must be remembered that the disease is invariably secondary to tuberculosis in the lungs. At the same time, the disease in the larynx may give rise to the more prominent symptoms; the loss of voice has a very depressing influence, and the pain and difficulty in swallowing may be such as to prevent sufficient nourishment or sleep. The laryngeal complication, therefore, greatly increases the gravity of the prognosis.

General treatment is of primary importance, and every case must be treated as a case of phthisis, of which the laryngeal affection is merely an extension. This treatment is best carried out in a suitable sanatorium (*see* PULMONARY TUBERCULOSIS). In addition, the patient with laryngeal complications should rest the voice; he may whisper, but even this should be reduced to a minimum. The cough, also, should be suppressed as far as possible. The patient must cough sufficiently to get rid of expectoration, but there is often a great deal of laryngeal irritation giving rise to useless cough. This irritation may be relieved by spraying the throat with simple cleansing alkaline lotions, such as a solution of borax, soda, and salt (5 gr. of each to the ounce of water), or with an oil containing menthol, camphor, oil of cloves, or thymol. Perhaps the best of all sprays to relieve cough is 'Spirone'. If a drug is required, heroin or codeine in a sticky mixture is probably as safe and effective as anything.

The local treatment depends chiefly upon the site and extent of the local lesion and upon the patient's general condition.

1. If there is a tuberculous tumour in the larynx, either growing from a vocal cord or in the interarytenoid space, and the patient's general condition is good or his health improving, it will generally be wise to remove it. This can be done under local anæsthesia, with forceps or by curetting. After the growth has been removed, its base should be cauterized with a strong caustic, such as chromic acid or nitrate of silver fused on a probe, or with the galvano-cautery. The whole operation may be carried out with the cautery, the point being plunged deeply into the tuberculous tissue and three or four punctures made at each sitting. By this treatment a dangerous local lesion may be cleared away, with great improvement to the patient's general and mental condition.

2. In cases of superficial ulceration of the vocal cords, the surface of the ulcer may be curetted under cocaine, and then chromic acid or nitrate of silver freely applied. One to two sittings at intervals of three or four weeks often effect a cure if the patient's general condition is good. In some cases, when the ulcers have healed, the cords are left ragged, with small fibrous nodules. These nodules do little harm, except that they greatly impair the patient's voice. They may be removed either with forceps or with the cautery, usually with excellent results.

3. Where there is chronic thickening of the arytenoid region or of the ary-epiglottic folds, with no tendency to ulceration—when the condition has become chronic, and the patient's general health is improving—the swelling may be reduced with the actual cautery. This is applied under cocaine, and the cautery point is thrust deeply into the œdematous mucous membrane. Two or three places only should be done at a sitting, and should be allowed to heal before other places are touched. If the punctures heal rapidly, and healing is followed by considerable reduction of the swelling, the treatment may be continued until all the swelling has disappeared. If this treatment is carried out in unsuitable cases, where the patient's general condition is bad, the cautery is apt to produce ulceration which tends to spread rather than to heal.

4. Localized ulcers associated with œdematous infiltration may be treated in a similar way, especially if not actively spreading.

5. If the epiglottis is ulcerated, or even infiltrated, especially if there is dysphagia, the epiglottis should be removed. This operation can be carried out under local anæsthesia, the affected part being well painted with cocaine. A large punch forceps, such as that shown in *Fig.* 48, is then pressed down over the epiglottis, which is removed with a single punch. This operation gives rise to very little bleeding or subsequent distress. The patients may immediately experience relief, and be able to take solid food with comfort.

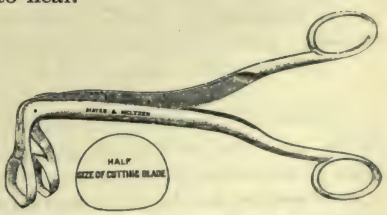


Fig. 48.—Punch forceps for the removal of the epiglottis.

The operation should always be carried out when necessary to relieve severe dysphagia, even if the patient's general condition is unfavourable. Large pieces of infiltrated mucous membrane in the arytenoid region have been similarly removed with punch forceps, and good results are reported, but I have no personal experience.

The above methods are indicated when the pulmonary disease is improving and the local condition is such that great improvement, or even cure, may reasonably be expected. When, in spite of general treatment, the chest condition is getting worse or the patient's strength is failing, treatment must be limited to relieving the more distressing symptoms, *pain*, *dysphagia*, and *dyspnœa*.

Pain.—The pain may be relieved with lozenges of menthol and cocaine or orthoform. A very valuable remedy is the insufflation of orthoform in powder. This should be blown into the larynx about half an hour before the principal meal of the day, and may give relief to pain for twenty-four hours. The patient himself can be taught to suck up the orthoform into his larynx by means of a Leduc's tube (*Fig.* 49). The powder is harmless, and 5 to 10 gr. can be insufflated at each sitting. If these means fail to relieve the pain, heroin or morphine can be given internally or by hypodermic injection.

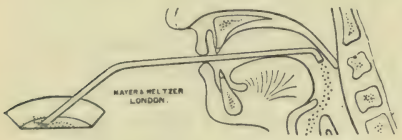


Fig. 49.—Leduc's tube for insufflation by the patient.

Dysphagia.—Where there is great pain or difficulty in swallowing, the food must be carefully prepared. As a rule, soft, semi-solid food of an unirritating character can be taken better than liquids. No solid food should be given, and liquids should be thickened as far as possible by the addition of gelatin or starch. If, in spite of this, there is great difficulty in taking food, owing to the tendency for some of it to enter the larynx, Wolfenden's position should be tried. The patient lies prone, with his head hanging over the end of a couch, and sucks the nourishment up through a glass tube. The pain of swallowing may be relieved by a spray of cocaine before each meal, by a cocaine and menthol lozenge, or, better still, by insufflating orthoform as above described. When the dysphagia depends upon an infiltrated or ulcerated epiglottis, amputation of the epiglottis should be carried out, even in advanced cases of phthisis, if the patient is capable of standing it.

Dyspnœa.—In rare cases, where there is considerable infiltration and thickening in the region of the vocal cords, there may be dyspnœa ; but, as a rule, ulceration takes place before there is sufficient thickening to produce obstruction. If there is dyspnœa, relief may sometimes be given by simply puncturing the swollen tissues with a laryngeal curette under cocaine ; but if this fails, or is not considered advisable, tracheotomy must be performed. Tracheotomy should never be carried out unless urgently required, because it almost invariably increases the patient's distress and his general symptoms. The cough becomes less effective, there is difficulty in expectoration, and the secretions accumulate in the lungs, leading to rapid spread of tubercle, together with signs of increased sepsis. The temperature rises, and the patient rapidly grows worse. Tracheotomy is therefore only a means of prolonging life by preventing asphyxia. *H. Lambert Lack.*

LEAD PALSY.—(*See* PLUMBISM.)

LENS, DISLOCATION OF.

1. **Congenital.**—This condition is treated either with glasses, optical iridectomy, or needling, according to the degree of the dislocation and state of vision.

2. **Traumatic.**—(*See* EYE, INJURIES OF.) *W. Tindall Lister.*

LEPROSY.—This intractable disease sometimes results in spontaneous cure, and in all cases the progress is subject to great variations. Periods occur during which the disease advances, retrogresses, or remains apparently stationary.

Attention to cleanliness, good food, and bodily comfort, in many cases is associated with marked improvement, and in a cold bracing climate similar marked improvement is common, and may be maintained for years.

Numerous drugs, local applications, sera, etc., have been advocated from time to time, but all, when fully tested, have proved unreliable. Some drugs, such as the

iodides, are injurious. Of the others, sodium salicylate appears to be of some value during the febrile attacks. Mercury has been advocated for long periods and in many forms, and occasionally appears to be of value, especially in cases and in circumstances where there is a tendency to improvement. Intramuscular injections have the most effect.

Chaulmoogra oil, in gradually increasing doses (commencing with 3 min. three times a day in capsules gradually increased up to 30 min. three times a day), and gurjun oil, commencing with 10-min. doses, have many advocates. The same oils, diluted, are used as liniments. Latterly intravenous injections of the essential oil of chaulmoogra combined with sodium—the gynocardate, and hydnocarpate of soda—have given encouraging results. These salts are given in doses of from $\frac{1}{10}$ to $\frac{4}{5}$ gr. in a 3 per cent sterilized solution, and the treatment is persisted in for several months on end. For intramuscular injections, a minimal dose of 2 c.c. of sodium gynocardate and a maximal one of 12 c.c. is recommended. Rogers advocates the combination of sodium morrhuate with the gynocardate as being more beneficial.

X rays have given good effects on the local manifestations, but must be used with great care, as the leprotic tissues are of low vitality.

Injections of 'Nastin', a fatty extract from a streptothrix (? of lepra) were at first said to produce markedly beneficial effects, but this method has now been abandoned.

The special manifestations may require surgical treatment. Amongst the minor of these, the painful perforating ulcers are readily relieved by free incision, dividing both the base and sides of the ulcer and subjacent tissues. *C. W. Daniels.*

LEUCORRHŒA.—Leucorrhœa, pure and simple, is generally the result of morbid conditions of the cervix, and not of the endometrium. The natural secretion of the cervix is a glairy mucus, and this may be present in excess. In many cases, especially in single women, this is the result of general ill-health, and not the cause of it, as is the popular idea. It is a pure hypersecretion, not due to any definite local lesion, or to bacterial infection. The importance of distinguishing simple leucorrhœal discharges from purulent or mucopurulent discharges due to infective conditions of the cervix or endometrium is obvious.

In married or parous women morbid changes may be discovered in the cervix which account for the discharge. In addition to changes in the cervical mucosa, the cervix may be bilaterally torn and the lips everted. If the discharge in these circumstances is immoderate, antiseptic or astringent douches, together with general tonic treatment, may be employed. In more severe cases solid nitrate of silver or pure carbolic acid may be applied to the cervix two or three times at intervals of a few days. Frequent applications of strong caustics to the cervical canal are dangerous, and if they fail to effect an improvement after the third application should not be repeated; such applications should be reserved for severe and long-standing cases. Trachelorrhaphy, or even the removal of the lips of the vaginal portion of the cervix if much hypertrophied and everted, may be required in very chronic cases of leucorrhœa which have not been benefited by the treatment above described. *Eardley Holland.*

LEUKÆMIA.—In regard to treatment, it must be remembered that there are three main varieties of the disease: acute lymphatic leukæmia or myeloblastæmia, chronic lymphatic leukæmia, and chronic myeloid leukæmia, which is often called splenomedullary. The first of these runs a course of from a few days to a few weeks, and is invariably fatal. Very rarely, cases which commence acutely become less acute and pass into the chronic form. No treatment, beyond the symptomatic, is of any avail. The symptom which is apt to be most troublesome is hæmorrhage from some of the mucous surfaces. This is often the cause of death. The use of the *x* rays in this type has seemed rather to hasten the process than to retard it, apparently by a toxic action. Chronic lymphatic leukæmia, as regards its symptoms and physical signs, is not distinguishable from the myeloid form, except by examination of the blood. The only other distinction between the two is that in the lymphatic form the lymph-glands are more apt to be enlarged, and at an earlier period of the disease. These cases are very rare, and the treatment does not differ from that of the next form. Before the application of the *x* rays to the treatment of myelæmia, the remedy most used was arsenic, and very good results were sometimes

obtained from its employment. What was aimed at was the diminution of the leucocytes in the circulating blood, and the diminution in the size of the spleen ; and these ends were very often attained, especially in cases which had not lasted too long. The drug had often to be given in full doses, very much in the same way as is the rule in pernicious anæmia. It is a very valuable adjuvant to other forms of treatment, especially in cases where there is anæmia. It must not be forgotten in connection with any form of treatment in this disease that some cases show well-marked remissions, and the leucocytes may fall to normal without any treatment whatever. The condition is so insidious in its onset that cases probably rarely come under observation until the disease is well established.

Of late years a large number of cases have been treated with *x* rays which have been applied over the spleen and long bones. The results have been very surprising. The spleen has diminished in size, sometimes falling back almost to normal, in a comparatively short time and with only a few exposures, and *pari passu* with that, the circulating leucocytes have greatly diminished in numbers and the general condition of the patient has improved. The earlier the case, the more certain is this result, and the more rapidly can it be brought about. Very old-standing cases, and especially those which have become anæmic and are in poor health, either do not respond so well or take a longer time to do so. There is no doubt whatever that this is a more certain method of producing a remission than by arsenic, but it ought to be clearly understood that it is not capable of curing the disease. Cases which were supposed to be cured in the early days of the treatment are now reported as having died ; second courses of *x* rays are not so uniformly successful as the first, and in a certain number of cases there is practically no improvement, either in the size of the spleen, the general condition, or the leucocyte count ; still there is little doubt that the duration of life in many cases has been prolonged. It has not been clearly ascertained how the rays act. It is evident, however, that the leucocytes in the body are broken up, as there is a large initial increase in the amount of uric acid in the urine. This increase soon ceases, though the diminution of leucocytes goes on, and it seems probable, therefore, that the rays act by preventing the formation of leucocytes as well as by breaking them down. Some observers consider that this breaking down is due to the production in the blood of a substance toxic to leucocytes ; others regard it as directly due to the action of the rays. The point has not yet been settled. Experiments in animals and some actual cases in human beings show that the treatment can be carried too far, and that it must be carefully controlled by blood examinations, for by prolonged action the power of the marrow to produce leucocytes can be completely abrogated, and also the functional activity of the nucleated red corpuscles in the marrow may be interfered with, so that a blood picture exactly like that of pernicious anæmia may be produced. Recovery takes place with stoppage of the radiation and the use of arsenic. The cells which are mainly destroyed are those of the granular series. The basophils and eosinophils of polymorphonuclear type are the first to disappear ; then the myelocyte forms ; then the polymorphs and myelocytes of the neutrophil series ; while the lymphocytes are much less affected by the rays. In cases where these cells are present in large numbers, this may produce a condition of blood like a lymphatic leukæmia. In other cases, apparently in the more advanced ones, the total number of cells may lessen, but the qualitative relations may not alter ; that is to say, myelocytes are still present. Great care must be taken in the actual application. Burning of the skin, of course, must be avoided. The applications should not be too prolonged, nor follow one another too quickly, as rises of temperature and other phenomena evidencing a toxic action may follow. Radiation twice, or at most thrice, a week is usually found most efficacious. The long bones should be attacked in turn, regions being arranged, one of which may be irradiated at each sitting.

Recently benzol has been much used, given in capsules containing 5 min. with 5 min. of olive oil. The treatment is begun with one capsule t.i.d. after meals, and the dose increased steadily. Continental physicians have given large doses, and claim excellent results. I have never found patients able to take more than 20 min. of benzol t.i.d. without serious gastric disturbance, and sometimes considerable febrile reaction. In the course of the latter the leucocytes may drop to normal, as they are apt to do with any febrile complication, but they rise again to the previous level when the attack is over. Considerable symptomatic improvement is often obtained, but in only a few cases have I

seen the leucocytes drop to anything near the normal, or the spleen materially diminish in size. When possible, this treatment should be combined with radiation, as better results may be got in this way than by either method alone.

Radium is the most recent form of treatment, and I think the most successful. When applied to the spleen it reduces its size, causes a drop in the leucocyte count, and improves the general condition. I have not yet seen it fail, and in several cases it has produced marked improvement when the cases had previously proved refractory to *x* rays. It does not seem to be so necessary to apply it over the long bones. As in other radium applications, it is desirable to have a thorough application at once, and not to repeat it till some months have elapsed, though some prefer to repeat the treatment once a week till remission occurs. The leucocytes must not be brought below 20,000 per c.mm., and just as with *x* rays, the red count must be carefully watched.

I have had no good result with salvarsan, though I have tried it in a number of cases.

Removal of the spleen has frequently been performed, especially in America, but with no effect on the course or duration of the disease. The mortality of the operation, in skilled hands and after the spleen has been diminished in size by radium, is surprisingly low. Symptomatic improvement is said to follow; but as the treatment with radium alone often causes great improvement, which continues and even increases for months after the application, it may be doubted whether the improvement is due to the operation. Even the advantage of removing an enlarged organ which may be causing disturbance by its weight and pressure is not a reason for operation, as radium alone will reduce the spleen till it no longer projects beyond the ribs. As the marrow is the primary seat of the disease, it is not to be expected that splenectomy would cure the disease.

In cases where anæmia is prominent, iron or arsenic should be given, along with other measures, according as the colour index is low or high. *G. Lovell Gulland.*

LICHEN PLANUS.—The method of development, and the symptoms which often accompany this disease, suggest some general cause, and we find that it is most readily attacked by internal remedies. Of these, the first place may be given to mercury, which, in the majority of cases, acts with great rapidity in dispelling the eruption. The drug may be given in any convenient form, and the dose should be equivalent to $\frac{1}{12}$ gr. of the perchloride thrice daily. If mercury should fail, recourse may be had to the older remedy arsenic, which is often satisfactory. If that in turn does not dispel the eruption, antimony may be tried.

In acute cases, local applications are chiefly useful in allaying the itching, which is very severe, so severe sometimes as to threaten the patient's mental balance, and for this purpose lotions of tar or carbolic acid may be used. In the chronic patches in which the disease often lingers on the limbs local applications are of more value. Unna's ointment —hydrarg. perchlor. 2 gr., carbolic acid 15 min., zinc ointment 1 oz.—may be tried; or salicylic ointment 5 per cent, or the tar ointment of the Pharmacopœia. In obstinate patches, the *x* rays may be resorted to with considerable confidence. *Norman Walker.*

LICHEN URTICATUS.—(*See* Urticaria.)

LIP, EPITHELIOMA OF.—(*See* Mouth and Pharynx, Malignant Disease of.)

LITTLE'S DISEASE.—(*See* Palsies, Cerebral.)

LIVER, CIRRHOSIS OF.—(*See* Cirrhosis of Liver.)

LIVER, HYDATID DISEASE OF.—This condition is to be treated in almost all cases by laparotomy; in a few cases it may be advisable to approach the disease through the thoracic wall. Aspiration and injection of the cysts should no longer be practised, for the method is rarely successful, and involves at least as much risk as the open operation.

The most satisfactory procedure is enucleation of the cyst and closure of the cavity in the liver without drainage; when this is not practicable, the cyst should be opened, its contents cleared out as far as possible, and free drainage established. *Crisp English.*

LIVER, INJURIES OF.—In severe abdominal injuries the liver is more likely to be ruptured than any other viscus, and this accident is a particularly fatal one. In many cases the injuries are multiple and severe, and the patients die either at once or within a few hours. On the other hand, rupture of the liver may be caused by an apparently slight injury, and the serious nature of the case may easily be overlooked.

In all open wounds of the liver, immediate operation is necessary, for in these cases there is probably a large quantity of extravasated blood, foreign bodies may be present, other viscera usually are damaged, and the risks of septic infection are great. In cases of subcutaneous injury to the liver, the need for immediate operation depends entirely upon whether there is active or excessive hæmorrhage. Recovery from the slighter degrees of contusion and rupture may undoubtedly occur under palliative treatment.

Treatment.—The removal of the patient from the scene of the injury must be carefully superintended ; in fact, in certain circumstances it is best to postpone removing him until some improvement in his condition has occurred. He is then put to bed, and kept absolutely still in the horizontal position ; regular observations are made of the pulse, respiration, and temperature. Warmth in the form of blankets and hot bottles is applied according to the degree of shock ; if there are symptoms of hæmorrhage, an ice-bag or Leiter's tubes may be placed over the right hypochondrium.

If the shock is severe, it must be actively treated by the usual methods ; if the shock is moderate, the patient may be allowed to recover from it without active assistance, for the measures which relieve shock tend to restart or to increase the hæmorrhage. No fluid or food should be given by the mouth, but nutrient enemata should be ordered if the patient survives the first few hours. Pain should be treated by giving acetylsalicylic acid and phenacetin, 5 gr. of each, and repeating this every four hours if necessary. Repeated vomiting is usually an indication for operation ; otherwise it may be controlled by 20-gr. doses of bismuth subnitrate ; morphia and purgatives are to be avoided. As the shock passes off, careful watch must be kept for symptoms of increasing hæmorrhage ; as stated above, all measures which tend to increase the blood-pressure must be avoided.

Operative Treatment.—This is indicated in all cases of open injuries to the liver, and in cases in which there are signs of severe or increasing hæmorrhage. If the initial shock be profound, operation must be delayed for two or three hours until the patient is in a condition to stand it. The abdomen is opened in the outer part of the right rectus muscle by a vertical incision ; if more room is required, part of the rectus muscle is divided transversely. The simplest and most efficacious method of dealing with the wound in the liver is by packing it with dry sterilized gauze ; this at once controls the hæmorrhage, and is more satisfactory than any attempt at suturing. The gauze is left *in situ* for about four days, and then is loosened and gradually withdrawn an inch or two at a time, preferably at first under light anæsthesia. The extravasated blood must be thoroughly mopped away, and it is usually advisable to flush the peritoneal cavity with saline solution. (*See also* Wounds of the Abdomen.) *Crisp English.*

LOCOMOTOR ATAXIA.—(*See* Tabes Dorsalis.)

LUDWIG'S ANGINA.—(*See* Angina Ludovici.)

LUMBAGO.

General Treatment.—In a case of lumbago it is of paramount importance to ascertain, as exactly as possible, its true nature.

Gouty cases form perhaps the largest proportion ; they are usually males of middle age and of the working classes. These demand the careful regulation of diet, etc., required by the uric acid diathesis (*see* Gout) ; medicinally, a combination of colchicum and iodide of potassium sometimes acts like a charm :—

℞	Potassii Iodidi	gr. v	Magnesii Sulphatis	gr. xxx
	Spiritus Ammoniæ Aromatici	♏xv	Aquæ Menthæ Piperitæ	q.s. ad ℥ss
	Vini Colchici	♏xx		

Thrice daily in half a tumbler of water after meals.

True rheumatism may be the cause in a smaller group ; in these, salicylates combined with alkalis will bring about rapid improvement :—

℞ Potassii Citratis		Spiritus Ammoniæ Aromatici	
Sodii Salicylatis	āā gr. xv	Tincturæ Aurantii	āā ℥xx
		Aquæ Chloroformi	q.s. ad ℨss

Every four hours.

Salicylates thus prescribed should be left off gradually, and a dose taken, say, twice daily for at least ten days after the pain has disappeared. In obstinate rheumatic cases, quinine, with small doses of opium, should be given a trial : —

℞ Quininæ Sulphatis	gr. v	Syrupi Aurantii	ℨj
Acidi Hydrobromici Diluti	℥xv	Aquæ	q.s. ad ℨss
Tincturæ Opii	℥vij		

Thrice daily.

Traumatism may be responsible for an attack of lumbago. Often a sudden muscular effort is the exciting factor in a gouty or rheumatic patient, and as such demands no special treatment. Occasionally, a sprain or ' rick ' of the back is followed by persistent lumbar stiffness, which may be classed as chronic lumbago. In such cases it may even be necessary to resort to an anæsthetic and various surgical manipulations to break down adhesions.

Local fibrositis is now known to be the pathological condition responsible for many cases of lumbago. The essential change is an inflammatory hyperplasia of the white fibrous tissue in the affected part : in lumbago the aponeurosis, insertions of muscles, fasciæ, and periosteum are the parts implicated. Definite indurations from an eighth of an inch to an inch in diameter may occur.

In acute cases a saline aperient should be given at the outset, and the patient confined to bed. Acetylsalicylic acid in 10-gr. doses every four hours is useful for the relief of the pain ; or the following combination :—

℞ Phenacetini	gr. v	Phenazoni	gr. vj
Acetanilidi	gr. ij		

To be taken thrice daily.

In the less acute stages potassium iodide is the most valuable drug :—

℞ Potassii Iodidi	gr. x	Tincturæ Nucis Vomicæ	℥x
Spiritus Ammoniæ Aromatici	℥xv	Decoctum Cinchonæ	ad ℨss

To be taken thrice daily.

If the iodide produces severe symptoms of iodism, one of the organic iodine compounds such as iodipin in the form of tablets may be substituted.

In all cases of lumbago special attention must be given to securing a free action of the excretory organs. A brisk purge should be given at the onset, and a daily evacuation of the bowels secured by a suitable aperient if necessary. The patient should be encouraged to drink freely of water, or other bland fluids, to promote the action of the skin and kidneys. Morphia is seldom or never necessary. After the attack is over, a consideration of preventive measures is necessary, and these suggest themselves ; the wearing of a ' cholera ' belt seems, at times, to aid in avoiding recurrence.

Local Treatment.—In every case some form of local treatment is called for, and, as a rule, is of more value than internal medication. At the onset, well-made linseed and mustard poultices, or an application of an infusion of capsicum, applied across the loins, will often give unspeakable relief. A partially-filled hot-water bag is more convenient and almost equally efficacious. When available, a hot vapour bath or the electric light cabinet bath may be very useful. Counter-irritation in one form or another remains our sheet-anchor. Brisk friction with turpentine liniment, followed by the application of hot cotton-wool fixed with a flannel bandage, is an excellent remedy. Unguentum antimonii tart. (B.P.) thoroughly rubbed into the affected part until pustules appear has also been strongly recommended. Croton-oil liniment may be used in a similar way. One of the best external applications is a mixture of equal parts of chloral hydrate, camphor, and menthol. These three substances form a liquid when well rubbed together, and this should first be painted over the painful area, and then gently rubbed in with the fingers. Some patients find the cold sensation produced by the menthol objectionable ; in such

cases the menthol may be omitted and equal parts of chloral hydrate and camphor employed, which also form a liquid when rubbed together. Another useful external application is to paint the painful area with weak tincture of iodine, and then to apply a hot linseed poultice or a very hot fomentation. The heat converts the iodine into a vapour, which exercises an anodyne effect, and probably by absorption acts directly on the affected fibrous tissues. In the later stages, the aconite, belladonna, and chloroform liniment applied on lint is frequently most beneficial. Blistering is worth a trial in more obstinate cases. Acupuncture has sometimes succeeded when a lumbago proves more than usually intractable : ordinary surgical needles may be used, thrust deeply into the lumbar muscles at the seat of pain, and withdrawn after five to ten minutes.

The most effective local treatment in lumbago is the application of superheated air. It is advisable to concentrate the heat on the affected part by one of the various forms of apparatus that have been devised for the purpose. The application of the superheated air lasts for fifteen to twenty minutes, and must be repeated daily. Luff advises that this form of treatment be supplemented by immediate ionization (cataphoresis) In acute lumbago, ionization should be done with a 2 per cent solution of salicylate of sodium at the first two or three sittings in order to produce immediate mitigation of the severe pain. In more chronic cases, Luff directs the employment for ionization of a 2 per cent solution of iodide of lithium, and directs that the negative ion (the iodine) should be driven into the affected tissues. The ionization lasts for twenty minutes, and should be repeated daily if the skin will stand the treatment ; otherwise it should be used on alternate days. Many patients improve rapidly from the first, but in severe cases a course of daily application for four weeks may be required. While this ionization treatment is being carried out, it is important that the administration of potassium iodide by the mouth should be continued. Humphris has recorded good results from the static wave current, following the employment of local heat. Massage is very useful in the later stages, but should only be employed when it causes no pain.

Not infrequently a case will be found to improve up to a certain point, and yet not entirely clear up : in such cases a course of spa treatment may be required to complete a cure. (*See also* RHEUMATISM, CHRONIC.) *Lewis Smith.*

LUMBAR PUNCTURE is admissible as a therapeutic measure in all cases in which there are signs of increased intracranial pressure, e.g., meningitis, cerebral tumour, fracture of the skull, uræmic coma, eclampsia, and in some cases of tinnitus and vertigo. Headache, vomiting, and coma may thus be relieved, and the danger of optic neuritis supervening may be warded off for a time at least. The procedure may be repeated when symptoms return. Lumbar puncture is carried out as follows : Draw a horizontal line across the back at the level of the highest points of the iliac crests. This line crosses the vertebral column at the level of the tip of the fourth lumbar spine, and the puncture should be made just below this spine in the fourth interlaminal space. Puncture may be made with a platinum-iridium needle fitted to an all-glass sterilizable syringe, or with an ordinary antitoxin needle, or a small trocar and cannula. The needle should be about three inches in length. The patient should be lying on the left side with the knees drawn well up and the trunk bent forwards, or he may sit on a low seat, stooping forwards with the hands on the ground. The skin should be sterilized and anæsthetized by means of an ethyl chloride spray. The index finger of the operator should be placed on the tip of the fourth lumbar spine, and the needle inserted half an inch below and to the right of that spot, the point being directed horizontally forwards and a little inwards, till the arachnoidal sac is reached. The syringe should then be detached and the fluid allowed to drop through the needle. Only a little fluid should be allowed to escape at a time : in most cases 5 c.c. will be enough. *Robert Hutchison.*

LUNGS, ŒDEMA OF.—(*See* CONGESTION, PULMONARY.)

LUPUS ERYTHEMATOSUS.—This is one of the most troublesome of skin diseases to treat, as the multiplicity of the remedies suggested shows.

One can recognize two distinct varieties, which may be described as the sebaceous or scaly, and the erythematous. For the scaly form, provided it is not widespread, Hebra's

treatment, which consists of the vigorous application of soap spirit on flannel, is often successful. For the erythematous form, dusting powders, and such applications as exercise a certain degree of pressure, e.g., collodion, are often valuable. It is of primary importance not to aggravate the disease, and it is a good plan to commence the treatment of almost any case with some soothing application such as boro-calamine lotion, on which many cases do surprisingly well :—

℞	Acidi Borici	ʒj	Zinci Oxidi	āā ʒiij
	Calaminæ		Aquam	ad ℥iv

Or,

℞	Zinci Sulphatis		Aquam	ad ℥iv
	Potassæ Sulphuratæ	āā ʒss–ij		

Ointments should, in the writer's opinion, be avoided, as they tend to irritate and spread the eruption. The following application will often be found useful :—

℞ Pyrogallol Oxidisatum 1 per cent in Acetone-collodion.

This was originally recommended by some German authority in 10 per cent strength, but that has not proved nearly so satisfactory as the weaker application. Quinine, in doses of 3 to 5 gr. thrice daily, strongly recommended by Payne and others, is occasionally useful in the erythematous type of case, but it more often fails than succeeds.

Like so many obstinate skin diseases, lupus erythematosus has run the gamut of all electric methods—Finsen, *x*-ray, and high-frequency. The Finsen method is reported to have been successful in several cases ; the results of *x* rays have been successful in some, disastrous in others ; and though the writer cannot speak of any marked benefit from general high-frequency applications, he has seen good results from sparking the lesions with a pointed electrode.

Recent experience suggests that these remedies must give place, in all except the acute cases, to the recently introduced treatment by the application of CO_2 snow. The good effects of this method in a disease so strikingly obstinate to treatment are most remarkable, and cases which have been under other treatment for years have been cured in a few months, sometimes in a few weeks, by the steady, discriminating use of this extreme cold. Those who are inexperienced in the use of this powerful remedy should begin with short applications, say of ten seconds, and should exercise only light pressure. But as they become familiar with the method the time may be lengthened and the pressure strengthened.

The curious relationship of this disease to chilblain indicates the desirability of promoting a vigorous circulation, and keeping the patient well over par ; though it must be admitted that the disease often enough attacks persons in apparently robust health.

Norman Walker.

LUPUS VULGARIS.—It is necessary in the first instance to differentiate between cases as regards their variety and extent. The writer finds it convenient to describe the varieties as simple, catarrhal, fibroid, and warty or verrucose. The circumstances of the patient, and his general condition, are also of importance in deciding on the line of treatment to be followed. It is well to lay stress at the outset on the all-importance of early diagnosis, so that cases come under treatment at the early stage, and the more severe varieties of the disease do not develop. And it may further be laid down that, in spite of the great prominence given to novelty, it is perfectly possible to treat a large number of cases of lupus without the aid of electricity, and indeed, in many cases, the older simpler methods are to be preferred.

Since most cases, when they first come under observation, are catarrhal, this variety may first be dealt with. This catarrh is due to the complicating presence of cocci, and is not a necessary accompaniment of the disease. The complication may be dealt with in various ways. It may be modified greatly by the internal administration of thyroid, to the extent of 6 to 10 gr. a day. It may be treated also by the application of mild antiseptic ointments, such as ammoniated mercury, 5 gr. to 1 oz. of vaseline, or by thorough scraping under anæsthesia. It is at this stage, and for this purpose, that the sharp spoon is most useful.

The fibroid form occurs most frequently on the limbs, and one may almost say of it that it has a natural tendency to recover. At all events, the prognosis is generally good. If the patch be very small it may be excised, care being taken that the incision goes both deep and wide of the disease. Generally it may be treated with success by the application of some counter-irritant, such as blistering fluid or liq. antimonii chloridi. Occurring as it does on the limbs, it readily lends itself to treatment by Bier's congestion method. But, as has already been said, the tendency is towards recovery, and it is not wise to generalize as to the value of any particular treatment of lupus from its effects in fibroid lupus on the limbs.

The warty form may be looked upon as a mixture of two diseases, tuberculosis and verruca, and the complication may be got rid of, either by the spoon, knife, or the application of the *x* rays, which affect both conditions.

There remains for consideration the treatment of the simple variety of the disease, i.e., those cases where there is no apparent ulceration, but only, below the epidermis, those brownish (apple-jelly) nodules which are characteristic of tubercle of the skin. If the patch be small and the position favourable, it may be excised. The line of incision must go well clear of the disease, in every direction, for if the situation be such as to incline the surgeon to conservatism regarding the amount to be removed, the disease returns in the scar, and the last state is worse than the first. The next method for consideration is the caustic one. Many caustics have a selective action, i.e., their effect is more vigorous and rapid on the feeble tuberculous tissue than on the healthy surroundings. Arsenious acid has long been a favoured remedy. Hebra's prescription was as follows :—

℞	Acidi Arseniosi	gr. x	Unguenti Rosæ	℥ss
	Hydrargyri Sulphidi Rubri	℥ss		

Or,

℞	Acidi Arseniosi	℥ss	Pulverem Carbonis Ligni	ad ℥j
	Orthoformi	℥j		

M. Fiat pulvis.

Sig. To be made into a paste by the addition of spiritus vini and applied to the part.

One of these is applied to the part for at least forty-eight hours (being changed at intervals), and, provided the patient can endure it, should be continued for twenty-four hours more. The pain is, however, very severe, and none of the suggested analgesic additions have, in the writer's experience, proved of much value in ameliorating it; so that one has to fall back upon the internal administration of morphine. At the end of the period mentioned, the healthy surroundings are seen to be violently inflamed, and the diseased area is studded with a series of little black sloughs corresponding to the nodules. Under some application (and in the writer's opinion it is not desirable to aim at too rapid healing, and he therefore usually prefers a strong iodoform ointment, or powdered uranium nitrate), the part heals up, and if the application has been continued for a sufficiently long time, the disease may be permanently cured. The main objection to this method is that the resulting scars tend to be unsightly. Its place has therefore been largely taken by salicylic acid, which is best applied in the form of Unna's salicylic creasote plasters. These are applied night and morning. At first there is no inconvenience, but as the salicylic acid penetrates, and bores out the elements of the nodules, a more or less constant pain is experienced, and this interferes very much with the use of the method in children. In a few days, the little white sloughs which represent the nodules separate, and the part may then be healed by zinc ichthyol salve muslin or some other soothing ointment. As before indicated, the writer prefers rather to delay healing, and always endeavours to persuade patients to persevere with the use of the plaster until complete healing has taken place. If that is not possible, he rubs in dry iodoform, or uses a strong iodoform ointment, or fills up the cavities with powdered uranium nitrate. If the disease is extensive, this method may still be used, different parts being attacked in succession. But when a very large area is affected and electric methods are not available, probably the best application is that known as Brooke's ointment, of which the following is the formula :—

℞	Zinci Oxidi		Acidi Salicylici	gr. xx
	Pulveris Amyli	āā ℥ij	Ichthyolis	℥xx
	Vaselini Albi	℥ss	Olei Lavandulæ	q.s.
	Oleati Hydrargyri (5%)	℥j		

M. Fiat unguentum.

The writer finds that Allan Jamieson's modification is much more easily remembered, and equally efficacious :—

℞ Unguenti Hydrargyri Oleati (5%) ℥j | Acidi Salicylici gr. xv
Ichthyolis ℿxx |

To be rubbed in for half an hour every night, and twenty minutes every morning.

It is essential that the directions for prolonged rubbing-in be carried out ; simple application is of comparatively little value. Under the prolonged use of this method, the nodules are reduced in number, and may then be attacked by one of the methods already described. When the nodules are so far reduced as to be easily counted, probably the best, at any rate the simplest, method of treatment is their individual destruction. This may be brought about in various ways. The galvano-cautery is an excellent method. It permits of great accuracy of application, and it evokes a secondary reaction which is beneficial. The fine-pointed thermo-cautery is more generally available, and in skilled hands is probably almost as useful. The difficulty in its application is that it is not so easy accurately to pick out the nodules, since the cautery is hot, and the patient, at first at least, shirks the apparent ordeal by fire. Still more simple is the method recommended by Mr. Hutchinson, in which wooden matches are sharpened, and dipped in solution of the acid nitrate of mercury, and then bored into each individual nodule. In this connection a caution must be given. The liq. hydrargyri nitratis is prepared with nitric acid, and a fresh preparation is very much more active than that which has stood on a consulting-room table for months, and sometimes far exceeds the intention of the surgeon in its effects. These may, if desired, be intensified by cutting off the piece of wood which has penetrated the nodule, and leaving it *in situ*. Unna has recommended 'gooseberry prickles' in preference to matches, but in the writer's experience they are inconvenient to handle, and no better than the matches. Carbolic acid may be used instead of the nitrate of mercury, and other caustics may also be chosen. In the case of children, who cannot be expected to submit patiently to the drawn-out pain of these methods, probably the best application is carbolic acid, for, although the pain is severe for a moment, the anæsthetic effects soon develop, and the pain is forgotten. The application of carbon dioxide snow, referred to under lupus erythematosus, is of value in some cases ; others fail to respond. Its application must be much more prolonged than in that disease, for here we aim at destruction.

The writer has already indicated his opinion of scraping, but there is no doubt that its temporary effects are good, and many patients have a preference for scraping, since it usually gives them a period of relief. But it must be recognized that it is hardly possible to *cure* a case of lupus by simple scraping. If one aims at a cure, the scraping must be very vigorous, and the resulting scars are often almost as disfiguring as the lupus.

The cautery was, and still is with some, a popular method of treatment in extensive cases. Anæsthesia is, of course, required, and the instrument must be used freely, in order to destroy the tissues deep down. If applied to the surface only, it is simply a severe form of counter-irritation. Kaposi used a solid stick of silver nitrate, with which he ploughed furrows in all directions through the disease. This was followed by some improvement, as indeed is any method of counter-irritation, but the method is rarely employed now.

Before passing to the consideration of the electric methods, it may be well to refer to the fact that lupus of the skin is very generally associated with diseased oral or nasal mucous membrane, and it is often distressing to find cases long and carefully treated as to the skin, while the disease has been allowed to go on unchecked in the mouth or nose. In the mouth we have in lactic acid a remedy of wonderful efficacy. Some authors prefer to dilute it, but the writer uses it in its full strength. The mucous membrane should be dried with cotton-wool before the application, and the mouth washed out immediately afterwards. (*See also* NOSE, TUBERCULOSIS OF.)

Treatment by Electricity.—Of electric methods, the most generally useful is the *x* ray ; for the expense, both initial and working, of Finsen apparatus, places it beyond the reach of all but wealthy hospitals. Here one need lay down only a few general principles ; those who intend to use these methods must go to fuller sources of information for their instruction. Here, too, the extent of the disease has to be carefully considered. If a patch is small it may be exposed—the surrounding parts being carefully protected by lead-foil

—for a considerable period of time (twenty minutes to half an hour) to the *x* rays from a soft tube, with the deliberate intention of producing an *x*-ray burn. The ulcer produced takes a long time to heal, but it requires only simple dressing, which can be done by the patient himself at home. The results are often very satisfactory. In widespread cases it is more customary to proceed by means of a series of exposures, using the rays from a tube which is moderately hard, and beginners, at least, should endeavour to keep under the line of reaction. There is, however, no doubt that a moderate reaction is beneficial, and as experience increases this may be aimed at, by the use either of longer exposures or of softer tubes. Since the edge is usually the part where the disease is most active, it is often a good plan to produce greater reaction there. As it is obviously difficult to do this by means of the rays, other methods are adopted in addition. The simplest of these is the plan of painting the edge with pure carbolic acid. Under the steady and prolonged—often very prolonged—use of the rays, the lupus steadily improves. The nodules diminish in number, the hyperæmia disappears, and in favourable cases the condition of the skin is restored to an appearance not very far from the normal. The two drawbacks to this method are, the occasional production of severe burns, although these are much rarer than they used to be, and the occasional production of cancer, which is, unfortunately, commoner. It is not possible to say definitely which cases are likely to develop this, a complication to which all cases of lupus are liable, but in the writer's experience it has developed mostly in what might be called the 'florid' cases of the disease, those associated with a good deal of hyperæmia and catarrh. It seems likely that this unfortunate complication is to be attributed not directly to the rays, but to the fact of their beneficial action compressing the ordinary years' duration of a case into a few months. It is the old cases of lupus which develop cancer, and by hastening the progress one seems sometimes to increase this risk. Needless to say, when this complication develops it must be immediately treated by surgical means. All cases of lupus which have been treated by *x* rays should be inspected at frequent intervals, so that this terrible complication may be detected and promptly treated at the earliest possible moment. It must be remembered that *x* rays produce many other effects than those desired, and the parts which it is not intended to affect must be carefully protected by lead. The effect of the rays in bringing out the hair must be kept in mind, and if convenient the eyes should be protected. The writer, however, believes that the danger to these is exaggerated, and in the treatment of rodent ulcers, where it was not possible to protect the eye, he has not seen any ill effects. Where, therefore, lupus affects the eyelids, the rays may nevertheless be applied. A further advantage which the rays possess is that their effects are not confined to the skin, but the mucous membranes in the neighbourhood are also affected.

Though not strictly within the scope of this article, the writer feels compelled to repeat his many warnings as to the effect of the rays on the operator. The sterility which has been proved to result in animals is a matter which must be considered where the administrator is exposed for hours to the effects of the rays. But undoubtedly the principal risk is the development upon the hands of warty growths which develop into epitheliomata. These are generally to be found on the hands of young enthusiasts, or of those who were once young enthusiasts. It should be a fixed rule never to expose the hands to the rays, and the plan of testing a tube with the screen on the operator's hand is one which no sensible man should ever practise.

The Finsen method has been described so often and so fully that it is hardly necessary to say more than that it consists in focusing the light from a powerful arc lamp upon the area of skin to be treated. The part must be rendered anæmic by pressure of a crystal lens, and this is further used to cut off the heat by means of a stream of cold water which circulates through it. Each application must be of an hour's duration, and its efficacy depends entirely upon the skill and care of the nurse who applies it. If she does not understand the principles, does not get the light properly directed, and does not keep up constant pressure, the results are nil.

If all has been properly performed, a blister is evident on the following day; this is let out and dressed with any simple dressing, and a fresh part is attacked. The treatment of an extensive case requires a very long time, and it is the writer's opinion that the Finsen method should be reserved for comparatively small patches, which can be gone over in a reasonably short time.

Allied to these methods is the exposure to the rays of radium. Unfortunately the expense of this is so great, and the quantities procurable are so small, that only limited patches can be treated. The effects are very similar to those of the *x* rays. It is possible to produce burns just as with them. In the writer's opinion, the greatest value of radium is in lupus of the palate, which is not easily got at by the rays, and is inaccessible to the Finsen method.

In uranium (another radio-active substance), which is easily procured, we have a means of treating lupus which may possibly come into more general use. The application may be continuous, and the beneficial effects are often striking. It is, of course, particularly useful to those living in the country where electricity is not available. It is conveniently applied in the form of the powdered nitrate, and preferably to areas which have been 'rawed' by the spoon or by salicylic acid plaster. It has a remarkable power of drying up discharge.

In conclusion, it may be said that the greatest remedy of all in the treatment of lupus is *perseverance*. The disease must be relentlessly pursued until the last trace of it has disappeared, and if the writer has seemed in any way to depreciate the value of the Finsen method, he fully appreciates that it is to Finsen we owe the lesson of perseverance in the treatment of this formerly uninteresting disease.

The use of Tuberculin.—For some considerable time the majority of the cases under the writer's care have had, in addition to other treatment, regular doses of tuberculin. For out-patients the T.R. variety has been used, in doses of about 0·001 mgrm. once every three weeks. It is not altogether easy to be dogmatic about the result, for it has only in rare instances been used alone ; but the impression conveyed to one whose experience in treating lupus is considerable is that the results of the other remedies are more rapid and striking when the patient is under tuberculin, and cases which have been under treatment for years have made more rapid strides when this addition to the treatment was regularly persevered with.

A large series of cases has been treated in hospital with Koch's old tuberculin. The usual initial dose is 0·0005 c.c., but regard must be paid to the extent of the lupus, and of course to the presence of other tuberculous disease. In from eight to twenty hours the reaction, both local and general, develops. The temperature rises to 101–2–3°, and the part becomes red and hot and discharges freely. Uranium nitrate is often applied at this stage. The patients are usually three days in hospital, and return at intervals of a month for subsequent doses. These are graduated according to the reaction, and in the later stages considerable doses are sometimes required. But if the temperature rises to 101°, no increase is made. Nearly every case has benefited, some of them markedly, and hospital physicians will recognize the testimony that the patients rarely fail to turn up when their admission order arrives.

Recently we have been giving tuberculin more frequently in small doses once, twice, even thrice a week. At present we are engaged in testing on a large number of cases a new form of tuberculin, supplied to us by Mr. John Fraser and Dr. McGowan, which is prepared direct from tuberculous glands. The results are encouraging and will be published shortly.

Tuberculin may also be used locally in the form of a 5 per cent ointment of O.T. In from twenty-four to thirty-six hours a marked local reaction is produced, which under the continued application of the ointment becomes more marked, without any rise of temperature indicating a general reaction. After three or four days the application is stopped, uranium nitrate or iodoform is applied, and the part heals up ; and when the hyperæmia has passed away great improvement is often noted. This method is of special value in cases of lupus in the neighbourhood of joints when contraction has taken place. After three courses of this treatment a patient, whose left elbow was contracted almost to a right angle, went round his local golf links in 76. *Norman Walker.*

LYMPHADENOMA. (*See also* Tuberculous Glands.)—A large number of conditions are often confounded under this name, the principal being indolent tuberculous glands, lymphosarcoma, pseudo-leukæmia, and the true lymphadenoma. It is often exceedingly difficult in life to distinguish between these, and it is no uncommon thing to find that a case which had been supposed to be lymphadenoma turns out to be

either tuberculous or sarcomatous. The really important point in diagnosis is to exclude tubercle. This may be done with fair certainty by the consideration of personal and family history; by the examination of other organs and of the sputum for bacilli; by the diagnostic injection of old tuberculin, etc. Should all these fail, it is advisable and justifiable to excise a gland, examine half of it microscopically, and transplant the other half into a guinea-pig.

If the glands are found to be tuberculous, the question of surgical interference must of course, be considered. If, for any reason, this is inadvisable, good results can sometimes be obtained by arsenic and cod-liver oil given together, and by the judicious application of some ointment containing iodine. Iodine has sometimes been injected into the glands, and this is a well-recognized form of treatment in Italy, where it seems to have met with more success than in this country. Of course, the ordinary hygienic measures necessary for all cases of tuberculosis must be carried out in these cases, in addition. Very good results are sometimes obtained by the use of tuberculin T.R. given in such doses and at such intervals as experience has shown to be proper. It is not wise for example, to use a greater initial dose than $\frac{1}{2000}$ mgrm. in adults, and in children a relatively much smaller dose, and as a general rule it is found that the positive phase, during which a second injection should be given, is at its maximum about a fortnight after the first dose. Care should be taken never to embark upon this course until pus, if present, has been removed, either by incision or aspiration, nor should it ever be attempted when there is acute or subacute periadenitis.

Lymphosarcoma admits only of surgical treatment, and that, unless the disease begins in some accessible part of the body such as the tonsil or cervical glands, has little prospect of success. In cases where the condition commences in the mediastinal or abdominal glands, it is, of course, impossible to remove these, and where it commences in the glands about the pelvic brim, it is usually too far advanced before the patient seeks advice for anything to be done.

Of true lymphadenoma very much the same may be said. The only remedy which has much influence over it is arsenic, and the effect of that is, as a rule, only temporary. Excision should always be practised if the glands are accessible, and if complete examination has satisfied the observer that no other glands are involved than the superficial ones. Too often one finds, by the use of *x*-ray photographs and other methods, that the superficial glands are only the terminal links in a chain involving the mediastinal or abdominal glands. In such cases operation is futile. I have treated some cases with *x* rays, but with disappointing results. Neosalvarsan is definitely useful. After injection, especially intravenously, soft glands shrivel and harden, temperature drops, the patient's general condition improves. In the late stages of the disease the symptoms will recur after a longer or shorter interval, and subsequent injections have a diminishing effect, but in early cases the effect is much more prolonged, and in some cases I have succeeded in staving off recurrence by courses of injection every six months. When glands have been excised, a course of neosalvarsan should be given afterwards. In some cases of lymphadenoma the patient is greatly distressed by evening rises of temperature, sometimes to a great height. I have known kryogenin of value in preventing this rise. It should be given in 5-gr. doses about an hour before the rise is anticipated, and, if necessary, repeated later in the day. For the weakness and prostration which attend the condition, cardiac tonics such as strophanthus and digitalis, rest in bed, and careful feeding with whatever the weakened digestion will stand, are essential. Fortunately, the course of the disease is often prolonged, and remissions of symptoms not infrequently occur. *G. Lovell Gulland*

MALARIA.—Quinine is the only drug that can be said to be a certain cure, but the method of administering the dose, and the compound used, vary in individual cases.

It is of the utmost importance that the diagnosis should be clearly proved by blood examination, as it may be necessary at any time to push the doses beyond the ordinary limits, and only when such certainty is attained are extreme doses justifiable. The importance of *early* and intensive quinine treatment, especially in subtertian cases, was well borne out in the late war. If quinine is judiciously given in the initial attack, a relapse may never occur at some future date. In all cases, during the pyrexial periods, rest in bed is essential. The diet should be light, fluids (other than alcohol) administered

abundantly, and the bowels freely opened. Changes of temperature, draughts, and chills must be carefully avoided.

Quinine is usually given as the hydrochloride, sulphate, or bisulphate. In some cases, where the taste is particularly objected to, the ethyl carbonate 'euquinine', in equivalent doses, can be given. As this preparation is tasteless, it is particularly well suited to children.

Method of Administration.—Quinine can be given by the mouth or rectum, or by intramuscular or intravenous injection. If given by the mouth, the effects are most certain when the drug is in solution. Uncoated tabloids of the hydrochloride and bihydrochloride and bisulphate are fairly reliable. Sugar-coated tabloids, pills, etc., are almost worthless, and may be passed per rectum unchanged. Quinine sulphate was much used during the war, and it seems that with the larger doses relapses are less frequent than with smaller ones. It is important that quinine should be given during active digestion, i.e., after food.

Rectal administration is useful in severe cases where frequent large doses are required, or where vomiting is persistent and intramuscular injections are objected to. The quinine should be dissolved with tartaric acid. If hydrochloric acid be taken as the solvent, the solution must be well diluted and the minimum amount of acid used. The injection is more likely to be retained if the medium be either normal saline solution or thin mucilage. In children, retention of the injection must be ensured by pressing the buttocks against each other.

Superficial hypodermic injections cause much pain, and *intramuscular injections* should be substituted. Tetanus has resulted from such injections, and quinine appears to increase the probability of such an event if dirty needles be used. The careless preparation of the skin, instruments, and solutions, that are safe enough with morphia and other injections, are full of risk in the case of quinine. The syringe and solution should therefore be boiled immediately before use, and the skin rendered as aseptic as possible.

With these precautions, there is little risk of tetanus or of abscess, although there may be some pain and induration for a few days. The injection should be made into a large muscular mass such as the gluteus maximus ; injection into the smaller muscles is more painful, and injection into the forearm has been followed by permanent paralysis of the median nerve. A daily dose of 9 gr. of the bihydrochloride dissolved in 20 min. of water will suffice for most of the intractable cases, but if there be any immediate danger to life, more frequent doses are absolutely necessary ; or this method may be combined with rectal administration.

Intravenous injection is occasionally required as a last resource. It is not, as a rule, more effective than intramuscular or rectal injection, and is more dangerous.

Dosage.—This must vary according to the severity of the case and in different attacks. Minute doses, even the small amount of quinine contained in half a drachm of Easton's syrup, may control or reduce the fever in some cases, whilst in others, 60 gr. a day have had little effect, even when given intramuscularly. It is on account of the variation in the dose required that it is so important, in any grave case, that the diagnosis should be certain, as heroic doses may be necessary in order to save life.

In an ordinary case of benign tertian or quartan malaria, 5 gr. three times a day is an ample dose ; smaller doses may be used, but with less certainty. In subtertian malaria, similar doses may be successful, but the attendant must be prepared to increase them greatly if symptoms do not speedily subside, or if any grave signs supervene. A daily intramuscular injection of 9 gr. is sufficient in the great majority of cases. The war has shown that benign tertian infections, where men are exposed to the sun and weather, may be extremely severe, and indeed are much more liable to recur in spite of quinine than are subtertian infections. In fact, if the patient becomes very debilitated and anæmic, quinine by itself seems to exert very little curative effect.

If coma should supervene, there is little time to lose, and large and frequent doses should be given, e.g., 16 gr. or more intramuscularly, and hourly rectal injections of 10 gr. till the symptoms subside. Under the free and frequent administration of quinine, even these grave cases usually recover rapidly. The risk of quinine poisoning must be run, for if the disease be not controlled, death will occur in a few hours.

Malarial convulsions in infants and children up to about five years of age belong to the same class of cases. Malaria in children shows comparatively few of the ordinary symptoms, and in the tropics its presence should be suspected in all cases of convulsions in children, particularly in those over six months old.

In such cases, rectal injections of quinine are of great value, and if ample doses are given, the convulsions speedily cease; but the doses to be effective must be large. Children stand quinine well, and a rectal injection of 5 gr. in a child a year old, followed by 2½ gr. every hour till the convulsions cease, and then repeated at longer intervals, will, in the majority of cases, save the patient. With smaller doses there is a much greater mortality.

These doses are much above those authorized in the British Pharmacopœia, or approved by some authorities, but with small doses the condition of the patient is desperate, and even these heroic doses will occasionally be insufficient. When the severe symptoms have passed, moderate doses will suffice to prevent recurrence, and these smaller doses may be continued, preferably in solution, by the mouth. Hot packs should be employed for adults and hot baths for children, and on any sign of cardiac failure, stimulants, preferably alcohol, should be freely administered.

Recurrences and relapses occur in the great majority of cases, and therefore, after convalescence from an attack of malaria, the administration of quinine should be continued for at least three months. It is well to reduce gradually the frequency of administration of the drug. For a full week after apparent convalescence, 5 gr. should be taken three times a day. For a further period of two weeks, 5 gr. once daily. Subsequently, 10 gr. two or three times a week, further reduced to once a week, should be taken.

Intolerance of Quinine.—Mere intolerance in the sense of dislike of the taste can be overcome in many ways, and especially by the substitution of euquinine in equal doses. The ordinary physiological effects are reduced by the use of bromides. The patient usually becomes less susceptible to these effects even when no bromides are given if he continues to take quinine.

In some exceptional persons, after frequent attacks of malaria, quinine may cause hæmoglobinuria. Such cases are not common, but do occur, especially in persons who have suffered from fever in Africa. In such cases, quinine must be administered cautiously, beginning with small doses, slowly increased till sufficient to control the fever is reached.

Various substitutes for quinine have been advocated from time to time. Of these, methylene blue is the most effective. It can be given in doses of 5 gr. in cachet with good effect, but is on the whole less certain in its action than quinine. Patients to whom this drug is given should be warned of the change that it will produce in the colour of urine and fæces.

Arsenic, in many forms, has been advocated. It does not destroy the parasites, and therefore is useless in the acute stages. During the convalescence, it is of high value in the treatment of the anæmia often present. Injections of salvarsan, novarsenobillon, and galyl have at different times been advocated in order to eradicate a malarial infection. There is no evidence that they do so effectively, but it is probable that they act as tonics and so enable the blood to regain its normal constituents.

Adjuvants.—Phenacetin, phenazone, and other antipyretic drugs have been advocated. No reliance can be placed on these drugs as curative agents, but they relieve headache, promote diaphoresis, and render the patient more comfortable. In small doses, and in mild cases, their use is therefore occasionally permissible. There is no object in giving such drugs merely to reduce the temperature, and in no case are they a substitute for quinine.

Hot drinks, such as weak tea and various native decoctions (lemon-grass tea, etc.), can be used freely to promote diaphoresis during the hot stage. *C. W. Daniels.*

MALIGNANT DISEASE, INOPERABLE.—(*See* CANCER, GENERAL TREATMENT OF; and under various organs.)

MALTA FEVER.—(*See* UNDULANT FEVER.)

MAMMARY ABSCESS.—Mammary abscesses appear to afford some difficulty in treatment, judging by the many cases in which secondary operations are necessary.

As soon as suppuration is evident, operation should be performed ; the skin should be very carefully cleansed with the most rigid antiseptic precautions, for it is important to avoid introducing any fresh organisms. A general anæsthetic should be given, either C.E. mixture, or gas and oxygen ; gas by itself is inadvisable, for it often results in a hurried and imperfect operation. Puncture of the abscess without an anæsthetic, a plan often adopted, almost invariably leads to failure.

The nature of the incision depends on the position and size of the abscess. The essential points are that the incision should be free, that it should be made as low in the breast as possible, and that it should avoid the main milk-ducts. In most cases the best incision is a large one in the lowest part of the breast ; a free opening here gives efficient drainage in the most dependent part, will not injure the main ducts, and will leave an inconspicuous scar. If the abscess is in the upper part of the breast, it should be opened from its lower and outer aspect. When there are multiple abscesses scattered through the breast, several incisions must be made, and be made freely, otherwise the whole breast may have to be sacrificed.

Mammary abscesses are often multilocular, and after incision it is essential to convert the loculi into one large cavity ; this is done by inserting the finger and breaking down the intervening septa. A large drainage tube is then introduced, and it is well to secure this to the skin with a stitch ; hot fomentations are applied, and the arm is placed in a sling. The cavity should never be scraped or irrigated. The fomentation should be changed about two hours after the operation, and then be repeated every four hours for the first two or three days ; the tube should be gradually shortened, and then be replaced by a smaller one.

The patient should be kept to bed for a few days, but should be encouraged to sit up in bed as much as possible in order to facilitate drainage ; the bowels should be kept well opened, and a liberal diet should be given ; iron and quinine do much good in these cases.

Persistent Sinuses.—When a mammary abscess has burst spontaneously or has been inefficiently opened, multiple sinuses are apt to form and to persist. In fact, in many of these cases the breast is riddled with sinuses, and this continued suppuration seriously affects the patient's general health.

Treatment.—At the earliest opportunity the sinuses should be freely opened up, their walls scraped, and the cavities treated with bismuth iodoform paste. Small pockets of pus must be thoroughly opened. The sinuses may be syringed with one of the following solutions : Mercury biniodide 1–1000 ; iodine 1 drachm to the pint ; or hydrogen peroxide 2½ vols. per cent. The arm must be kept at rest with a sling.

The most effective treatment, when it can be practised, is vaccine inoculation. Observations must be taken as to the micro-organism present ; the corresponding vaccine is then prepared, and its use will often bring about a rapid cure.

The treatment of the general health is almost as important as the local measures. Sea air will usually cause rapid improvement, whilst iron, quinine, syrup. ferri phosph. co., and salines are valuable.

In obstinate and long-standing cases, *amputation* of the breast may be necessary, but should be avoided if possible. If this operation is performed, special precautions must be taken to avoid infection of the wound ; the best method of rendering the opening of the sinuses aseptic is the use of the thermocautery.

Sub-mammary Abscesses.—These abscesses may be acute or chronic ; they show themselves by œdema at the base of the breast, and by forward projection of the breast, which itself is not affected. The treatment consists in early and free incision at the lower and outer part of the breast, with free drainage. (*See also* Abscess.) *Crisp English.*

MAMMARY NEURALGIA—(*See* Breast, Neuralgia of.)

MARASMUS.—Before beginning the treatment of wasting in an infant it is important to exclude, if one can, the presence of any grave organic disease. Tuberculosis, congenital syphilis, diabetes, and latent empyema are those which are most likely to be present. Assuming that none of these is found, attention should be directed to the state of the

stomach and bowels, and chronic vomiting or diarrhœa dealt with on the lines laid down in the articles on these subjects. If these also be absent and the case be one of wasting without apparent cause (i.e., one of true marasmus), the patient must be treated on general lines.

Attention to the hygienic surroundings is of the first importance. The child should spend much time in the open air (of course well protected from cold). Change to the seaside is often beneficial. The diet should be carefully considered. In the case of infants below four months of age a wet nurse should be procured if possible. Failing that, thoroughly peptonized cow's milk more or less diluted with water is the best substitute, or one may use condensed milk or one of the half-cream dried milks. (*See* INFANT FEEDING.) If there be constipation, Mellin's food often suits well. In the case of an infant about six months of age the effect of starchy food is always worth trying. It may be given in the form of baked flour or oat flour added to the bottles, or as Benger's or Savory & Moore's food. A child will often gain weight when fed in this way when he has failed to do so on any modification of milk alone.

In the case of children who are unable to digest *any* form of cow's milk, the diet may consist of whey and cream (1 oz. of cream to 8 or more of whey), of whey and raw white of egg, or of Mellin's or Savory & Moore's food made with whey, or of egg white (the white of one egg to 8 oz. of water sweetened with sugar). Yolk of egg may be added to the latter in small quantities, beginning with 5 min. of the yolk to the feed in quite young infants, the proportion being increased with age. In all cases raw beef-juice and cod-liver oil are useful adjuvants. Drugs are of little help except to meet special indications, but alcohol is sometimes useful.

Robert Hutchison.

MASSAGE.—There are certain broad principles in the administration of massage which involve the carrying out of the following special manœuvres.

Effleurage is a gentle stroking or rolling of the skin, gradually increased to moderately firm friction, and always directed centripetally. The palmar surfaces of the operator's fingers are employed when dealing with small areas, while over the larger surfaces the whole palm of the hand is applied to the patient's skin; occasionally the ulnar border of the hand is used in preference. Each stroke commences from the most distal point of the part under treatment; in the up-stroke somewhat firm pressure is applied, while in the down-stroke, which should be absolutely continuous, less pressure is used. From the beginning to the end of the manœuvre the hand of the operator does not leave the patient's skin, the rapidity of the stroke varying with the effect which one desires to produce. Rapid sharp strokes of 80 to 100 per minute are more stimulating, while slow firmer strokes of 60 to 70 per minute are rather more soothing in effect.

Pétrissage.—This is a kneading movement, and is one of the most difficult to perform correctly. The skin and muscles of the patient are grasped between the fingers of the operator's hand and kneaded seriatim from the peripheral parts to the centre of the trunk, the hold being alternately tightened and loosened.

It is of the utmost importance that neither the skin nor hairs should be dragged on, for this is both painful at the time and often productive of a crop of boils, which will put a stop to any massage for some time. In dealing with the larger groups of muscles, such as the quadriceps extensor, etc., it is well to use both hands at the same time. The muscles on both sides of the limb may be dealt with and rolled against the bone, constituting the special movement known as 'fulling', from its similarity to what the linen bleacher does.

Tapotement consists in a series of blows struck in quick succession, either with the fingers, the edge of the hand, or the whole hand. The blow is *staccato* in character, coming from the wrist, rapidly delivered, and with a certain rhythm. To produce a superficial effect the fingers only are used, while if we wish to act on the muscles and deeper-lying structures, a series of chopping movements or strokes are given with the ulnar edge of the hand along the whole length of the muscle in its transverse axis. Bearing in mind that the object is to produce a slight mechanical impression, stimulating but not painful, care must be taken, when the whole hand is used, that what is intended as a sharp tap or stroke does not degenerate into a smack. No pain or bruising should be produced.

When the ulnar edge of the hand is used, the fingers should not touch the patient's

skin, and the blow should come from the elbow. Considerable delicacy of touch is needed to carry out this movement successfully, and also considerable manual strength.

Friction Massage.—This consists in rubbing small circles from the peripheral parts centripetally, using the whole hand, the thenar eminences, or finger-tips, according to circumstances. It is of especial use when treating joints, or any part where kneading is impossible.

Vibration is in some respects a combination of the two preceding movements. A vibratory or shaking movement is added to them. It is the most difficult to learn of all the different massage movements, and is probably the only one which can be advantageously carried out by mechanical means.

There are several excellent electric vibrators on the market—the Barker, the Victory, and the 'Sanitas' Pulsator. The use of one of these apparatus is an admirable adjuvant to ordinary massage, and it is one of the most important passive movements used in medical gymnastics. A machine-driven instrument, from the rapidity of the strokes and absolute regularity with which they are administered, can produce effects unattainable by the human hand. The effect may be made soothing or stimulating as chiefly desired, the circulation of any part is improved, and absorption hastened.

General Massage.—While it is immaterial whether we commence our manipulation with the upper or lower extremity, it is well as a matter of routine to follow a regular order, as, for instance, legs, arms, chest, abdomen, and back. The patient, except for the last-named region, lies in the supine position throughout, with only so much of his body exposed as is under treatment at the moment.

Massage of one extremity is very much like that of another, so that what is said of the arm will in large measure apply equally to the treatment of the leg. In the case of patients who are hairy, however, it is often a good plan to crop the legs with a pair of scissors, or shave them, before trying to massage; much irritation, and even a crop of boils, may thus be prevented.

If the left extremity is to be manipulated, the masseur will stand at the patient's right hand. He begins by flexing and extending the toe two or three times, then the knee, ankle, hip-joint, etc. The patient's left foot is taken in the masseur's left hand, while with the right hand on the dorsal surface he strokes towards the ankle. Then the sole of the foot is kneaded with the fingers, and afterwards the skin around the malleoli and the tendo Achillis with the thumb and fingers.

When the left leg is being treated, the patient lies on his right side—the masseur may be seated. He supports the patient's heel on his knee or thigh while a few steady strokes are made upwards from the level of the ankle. The muscles of the calf are then thoroughly kneaded, as well as the muscles of the anterior surface of the leg. If the limb is large and fleshy, the more superficial layer of muscles is pressed and kneaded against the deeper layers (fulling); a little light effleurage then quickly concludes the treatment. After stretching the skin around the knee, and applying a little friction, the thigh is dealt with. Effleurage is at first applied to the whole thigh and hip. Pétrissage is then applied to the large group of muscles—quadriceps cruris and adductors—both hands being used at the same time. The movements must pass from below upwards, and effleurage is used at the finish as usual.

The patient lying on his right side, effleurage is then carried out around the head of the hip-joint, and the short muscles around the trochanter major are carefully kneaded with the operator's right hand.

In dealing with the upper extremity, the hand is manipulated much in the same way as in treating the foot; the thenar and hypothenar eminences are thoroughly kneaded and finished with effleurage, which is continued up the forearm. The wrist, elbow, and shoulder-joint are then freely flexed, extended, and circumrotated. Holding the patient's left hand in his right, the operator thoroughly kneads the forearm on its anterior and posterior aspects. Similar treatment is then carried out on the upper arm, finishing with the shoulder-joint.

The chest is treated to the extent of kneading the pectorals, with tapotement to finish in some cases. Effleurage may be applied all over the chest, the posterior surface being dealt with when the back of the whole body is massaged.

To treat the back, the patient lies as comfortably as possible in the prone position,

and friction and kneading are applied to the back of the neck. Effleurage follows along the whole back, somewhat vigorous and rapid in character.

Thumb and finger movements are applied to the erector spinæ and the deep muscles of the back, and following this the muscles of the hips and buttocks are thoroughly kneaded. Rapid effleurage of the whole surface of the back is now performed, and very quick stroking over the spine.

Massage of the Stomach and Abdomen.—The object of the treatment of the stomach with massage is twofold: (1) To increase its motility or contractile power when in an atonic condition; and (2) To improve the quality and quantity of the secretion.

Massage properly carried out will always increase the acidity of the gastric juice except when malignant disease is present. In hyperchlorhydria, the tenderness over the epigastrium will often prevent the carrying out of massage, and seeing that massage would aggravate the condition, this is just as well.

In cases of diminished acidity, however, massage may be very helpful. To reach the comparatively limited area of the stomach wall that is accessible to touch, the patient must in the first place be thoroughly relaxed and deep manipulations used; if there be any rigidity of the abdominal muscles these manipulations will be impossible.

If relaxation cannot be obtained when the patient is in the supine posture, with his legs drawn up and head raised, he should turn on his right side and the masseur work from behind him.

Deep kneading and shaking, occasionally followed by hand-vibration and slapping, are the movements most commonly employed. The treatment should be given about an hour after food, and should last from ten to fifteen minutes.

In applying massage to the abdomen, it should be seen to that the patient has emptied the bladder before beginning, and if possible had an action of the bowels. In order to get the muscles completely relaxed, the patient's head and shoulders are elevated, his knees flexed, and he is asked to breathe deeply and regularly. Some difficulty is experienced in getting the proper degree of relaxation in women—and nervous subjects generally. The patient's attention should, if possible, be distracted by conversation, etc.

To begin with, the masseur puts both hands underneath the patient's body until they meet under the lumbar region; the hands are then drawn forwards, compressing the patient's flanks and at the same time lifting somewhat until the hands again meet in the middle line of the abdomen. Deep kneading is begun in the right iliac space with both hands, and the entire abdomen kneaded thoroughly several times from the right to the left side. The left iliac space is treated in the same way, and the colon is followed through its entire course and treated with digital kneading.

The concluding movement is light pressure of the abdomen with the whole of the operator's hand, to which he then imparts a vibratory movement.

A practical point in conclusion is: Should we administer massage with a vehicle, such as powder or oil, or with the hand alone? A good deal of pétrissage and massage to the abdomen can be easily done with comfort to the patient through a light garment: but as a general rule it is well to use some powder or unguent. I have found a preparation of talcum quite ideal as a powder, but if oil seem preferable, Dee oil, a refined liquid paraffin, is best.

The following are some special affections advantageously treated by massage:—

Atonic Dyspepsia.—This is much helped by massage of stomach—chiefly effleurage directed from left to right, and hand vibration; tapotement is also used. The same treatment applies to cases where the atony has gone on to actual gastric dilatation.

Constipation.—Kneading is applied along the course of the colon, the treatment being finished with rather rapidly applied effleurage, right and left hand alternately. Specially good results are seen in children.

Headache.—If of digestive origin, general massage often helps; but carefully applied local massage is also useful and, along with pressure on nerves as they emerge from the different foramina, sometimes affords great relief.

Infantile Palsy.—General massage and electric massage of the affected parts are of much service—combined with movements, active or passive—the muscles and groups of muscles being trained to carry out co-ordinated movements. Contractures must be stretched, and may require some surgical intervention at the commencement.

Insomnia is frequently much benefited by general massage, which is best applied at bedtime; but it is useless or even harmful in some subjects whom massage fidgets.

Lumbago and Myalgia.—Massage is best applied after some form of local heat, such as an electric-light bath, and should consist of effleurage, pétrissage, and some vibration. Here the use of the electric or mechanical vibrator is sometimes followed by magical results, though the pain may return later.

Neuralgia.—Massage must be gentle in character, and is best associated with some warm application.

Neurasthenia.—Massage plays an important part in the 'Weir Mitchell treatment' of this affection. The patient is usually started with half an hour twice daily, and this is increased to an hour, electricity being sometimes combined with it.

Neuritis.—Massage is too painful to be borne in the acute stage as a rule, though sometimes light effleurage and kneading may be applied with benefit. Later on, as the condition improves, massage may be applied freely along with exercises.

Disseminated Sclerosis.—Electricity in any form increases the irritability of the nerve, and worries the patient; but plain massage and exercises are distinctly beneficial.

Progressive Muscular Atrophy.—The condition of the muscles is improved, and, along with it, the patient's general health. These patients are easily fatigued, so the massage must not be prolonged and must be gentle in character.

Paralysis Agitans.—Passive followed by active movements serve to strengthen the weak muscles and lessen the amount of contraction. The patient should practise assuming correct attitudes, and, walking in front of a mirror, endeavour to control the tremor by force of will.

Sciatica.—Massage is here of great benefit, kneading and vibration being applied over the nerve along with 'dry stretching'—or full flexion of the extended limb on the abdomen.

Writers' Cramp, etc.—The arm, shoulder, and upper part of the spine on the affected side should be massaged daily. The contracted muscles should be stretched and the muscles opposing them exercised actively.

Sprains.—Massage is of the greatest service, and may start from the day of the injury. It should be very light at first, lasting about ten minutes; increasing in a day or two to twenty minutes. At first it should be applied rather above the affected joint sprained, especially if there is much inflammatory effusion. *T. D. Luke.*

MASTITIS.—This condition may be conveniently described under three divisions: (1) Acute; (2) Chronic lobar; (3) Chronic interstitial.

1. **Acute Mastitis.**—This is usually associated with cracked nipples during lactation; it also occurs during pregnancy, shortly after birth, and at puberty, and as the result of injuries and the specific fevers.

Treatment.—Prophylactic treatment has been referred to under Nipples; any cracks or fissures of the nipple must be attended to; suckling must of course be stopped, and the milk should be drawn off gently with a breast pump. Hot fomentations are then applied with moderately firm pressure, and are repeated every three or four hours; the arm is placed in a sling. In order to diminish the secretion of milk, a light diet is given, with restriction of liquids, and the bowels are freely opened with saline purgatives. With this treatment most cases of acute mastitis will recover.

The difficult cases are those in which it is doubtful whether suppuration is occurring or not. The temperature is an unreliable sign, as simple mastitis may cause a considerable rise in nervous women. Suppuration may be suspected under the following conditions: (1) Failure of the swelling to subside under the treatment recommended above; (2) Any fixation of the skin over the indurated area; (3) Continued temperature; (4) Insomnia.

When in doubt an exploratory puncture may be made with a small scalpel or tenotome into the centre of the swelling, division of the main milk-ducts being avoided. An incision should not be made unless there is good reason to suspect pus, for if no pus is found the wound is very liable to suppurate, and a troublesome sinus may form. (*See* Mammary Abscess.)

2. **Chronic Lobar Mastitis.**—In this variety of chronic mastitis a portion only of the breast is affected, usually as the result of injury, or as a sequel of lactation; continued irritation, such as that of badly-fitting corsets, is commonly a cause.

Treatment.—All forms of irritation should be removed. The arm should be put in a sling and a breast bandage firmly applied. The best local application is the ointment or the glycerin of belladonna. If the condition persists, the breast should be firmly strapped, or mercurial ointment be firmly applied on lint. Repeated blistering will often cause rapid resolution of the indurated area. Iron, arsenic, quinine, and sea air are valuable.

If there is any doubt about the condition, or if it persists or increases in spite of treatment, the troublesome area should be excised.

Chronic Interstitial Mastitis.—This may occur at any age, but is met with most commonly between the ages of thirty-five and fifty; there is usually no obvious cause for it; both breasts are generally affected, but one may suffer more severely than the other.

Treatment.—The treatment of this condition forms a very difficult problem: no hard-and-fast rules can be laid down; each case must be considered individually, treatment varying with the extent and distribution of the mastitis, and with the age and general condition of the patient. The following points may be emphasized:—

1. In many cases, the condition is mild and non-progressive, and does not give the patient any serious trouble. She may come under observation complaining of a swelling in the breast which she fears may be cancerous; reassurance, if it can be honestly given, is the main treatment required. Belladonna plaster or liniment may be applied.

2. If the disease be more advanced, more active treatment is called for; and this applies especially to those cases in which the condition is distributed evenly in the two breasts, and in which pain is a prominent feature. The trouble can usually be cured or considerably improved by the following measures: the application of mercurial ointment on lint, a circular hole being cut for the protrusion of the nipple; over this a firm bandage is applied; a mixture containing sod. iod. 3 gr., potass. iod. 3 gr., and tinct. nucis vom. 5 min., is taken internally three times daily after food, half a glass of water being taken with each dose. Improvement as a rule shows itself in seven to fourteen days.

3. The application of *x* rays in half-Sabouraud doses at ten-day intervals has been strongly advocated and, in my experience, certainly produces most marked improvement in some cases. Trial therefore should be given to this method before proceeding to more radical measures.

4. The question of *operative treatment* has to be considered. In France and the United States it is customary to regard this condition as pre-cancerous, that is to say, as being liable to develop into cancer, and so operation is recommended far more commonly than in this country. There is no doubt that cancer develops in a certain number of these cases, especially in patients over forty; but there is equally no doubt that the liability to the development of cancer varies greatly in different types of chronic mastitis. Each individual case therefore must be judged on its merits, for in some the disease is comparatively harmless, in others it is a source of danger.

If the trouble is persistent in spite of treatment, and is the cause of pain and worry to the patient, excision of the breast should be advised. If there is hard, irregular induration in the upper and outer quadrant of the breast, with enlargement of glands, excision is advisable. If the patient is over thirty-five years of age, and the mastitis is definite and resists treatment, then excision should be recommended. Under these conditions the disease may be considered as clinically pre-cancerous, and as such should be thoroughly removed. Removal of the breast for non-malignant conditions is an easy and simple operation; extensive incisions are not required, and the nipple may be spared if desired. (*See also* Breast, Tumours of.) *Crisp English.*

MASTOID.—(*See* Ear.)

MEASLES.—In this disease the chief danger is from complications of the respiratory organs; every endeavour, therefore, should be made to avert them. The air of the room should be kept fresh, and at the same time at a temperature of 60° to 65°, and should be moistened by means of a bronchitis kettle, to the water in which some aromatic, such as eucalyptus, creasote, or compound tincture of benzoin, may be added with advantage.

The very irritating early laryngitis is usually relieved by concentrating medicated steam round the patient—by means of a tent if he is in a ward or a large apartment—and by applying frequently-renewed hot fomentations over the larynx and trachea, care being taken not to blister the skin, in case tracheotomy should be needful. A mixture containing bicarbonate of soda, ipecacuanha wine, and compound tincture of camphor should also be given every four hours. Only in extreme cases of dyspnœa, however, should surgical interference be sought, for usually the laryngeal symptoms will subside as soon as the rash makes its appearance. But if the laryngeal obstruction requires surgical relief, intubation should be tried in the first place. Great care should be taken that the

tube rests without pressure in the larynx, since in this form of laryngitis ulceration is easily caused. If the tube is constantly coughed out, tracheotomy should be performed, for in such cases persistence in intubation is almost certain to lead to ulceration.

The writer strongly recommends that in all cases of laryngitis in measles occurring in localities where diphtheria is at all prevalent, a subcutaneous injection of 4000 units of antitoxin be given. Laryngeal diphtheria, without any faucial affection, is a frequent complication of measles, and in most instances it is impossible to be sure, without waiting for two or three days, whether the laryngeal symptoms are due to diphtheria or not. Laryngeal symptoms arising after the appearance of the rash are especially likely to be due to diphtheria.

The photophobia consequent upon the conjunctival injection or inflammation necessitates that light should not be allowed to fall directly upon the patient's face. But the room should not be darkened except when the patient is asleep at night. In these cases the eyes should frequently be bathed with a saturated solution of boracic acid, and occasionally with adrenalin chloride, 1–1000, and cocaine, 1–2 per cent solution. These remedies will usually prevent more serious complications.

Special attention should be paid to the cleanliness of the mouth ; few cases of measles are without stomatitis in some degree.

A high temperature and delirium are best treated with cold sponging or cold-water packs. For robust children iced water may be used. If pneumonia be the cause of these symptoms, an ice poultice should be applied to the affected lung. At the same time 2 gr. sulphate of quinine should be given every four hours, with an alcoholic stimulant (brandy or champagne).

In other respects the lung complications should be treated on ordinary principles (*see* Pneumonia, Bronchitis, etc.). The most common is lobular pneumonia, and for this 3 or 4 min. of tincture of belladonna every four hours is very useful. The mouth must be frequently washed or swabbed out with the solutions mentioned in the article Fevers, Acute Infectious.

Vomiting is best met by peptonizing the milk and giving a bismuth mixture.

The treatment of diarrhœa depends upon its cause. If it be due to undigested food, giv less food for a time and peptonize it, or give whey ; clear out the bowels with a dose of castor oil. If the diarrhœa still persists, prescribe an astringent ; and if this fails to act, add small doses of compound tincture of camphor or laudanum. The writer has found the following mixture from the Guy's Hospital Pharmacopœia very useful :—

℞				
	Bismuthi Carbonatis	gr. ij	Mucilaginis Acaciæ	℥xv
	Pulveris Cretæ Aromatici c. Opio	gr. j	Aquæ	q.s. ad ℥j
	Glycerini Acidi Tannici	℥v		

If there is colitis, the lower bowel should be washed out twice a day with warm water. In very intractable cases, raw beef-juice should be tried, instead of milk or other nourishment. If the motions are very offensive, some intestinal antiseptic is indicated, as recommended in the article on Typhoid Fever. Severe cases of diarrhœa will require some stimulant : brandy is the best.

Other complications do not call for any special notice.

There is often much wasting after an attack of measles, especially when there has been diarrhœa of any severity ; so that during convalescence close attention must be paid to the child's diet. Cream, virol, cod-liver oil with iron, are often indicated in addition to the ordinary food.

Uncomplicated cases of measles may be allowed out of bed a week after the temperature has been normal, and out of doors in another week or two if the weather is fine. Such cases are free from infection at the end of three weeks from the appearance of the rash. Probably even complicated cases are free from infection at the end of four weeks. But it is advisable to keep pulmonary cases isolated till the lungs are clear.

Quarantine period : three weeks. *E. W. Goodall.*

MEDITERRANEAN FEVER.—(*See* Undulant Fever.)

MEGRIM.—(*See* Headache ; Migraine.)

MELÆNA NEONATORUM.—(*See* Hæmorrhagic Disease of the Newly-born.)

MEMBRANA TYMPANI.—(*See* Ear.)

MÉNIÈRE'S DISEASE.—(*See* Ear, Affections of; Vertigo; Seton, Treatment by.)

MENINGITIS.—For therapeutic purposes it is convenient to divide cases of meningitis into four main groups: (1) *Acute Infective Meningitis;* (2) *Epidemic Cerebrospinal Meningitis*; (3) *Syphilitic and Tuberculous Meningitis;* (4) *Posterior Basic Meningitis.*

1. **Acute Infective or Purulent Meningitis.**—Most of these cases are secondary to some septic process in the bones of the cranium, whence the organisms penetrate the dura mater and spread through the pia arachnoid. The majority of cases, as a matter of fact, follow suppuration, acute or chronic, of the middle ear.

The treatment of meningitis secondary to gross suppurative conditions of the cranial bones must first of all be directed to the original source of infection, and is therefore primarily surgical. The diseased area of bone must be freely exposed, and any pus must have free exit.

In addition, certain general measures, applicable to all cases of meningitis, should be adopted. These comprise the following: The patient must be kept in bed, in a quiet, darkened room, his head shaved, and an ice-bag or a Leiter's coil of cold tubing applied to the scalp. In cases due to ear disease, leeches should be applied behind the affected ear. A mercurial purge, such as calomel or blue pill, followed by a saline aperient, is administered, and the bowels thereafter are kept regular. If the temperature become alarmingly high, use sponging. Convulsions should be controlled by a mixture containing potassium bromide 20 gr., chloral hydrate 10 gr., syrupus aurantii ½ drachm, and aqua chloroformi to 1 oz., repeated every four hours if necessary. Repeated withdrawal of cerebrospinal fluid is of great value, not only for purposes of diagnosis, but as a therapeutic measure. It diminishes the excessive intracranial pressure, thereby tends to relieve the headache, and sometimes even restores a comatose patient for a time, at least, to consciousness. The amount of fluid to be withdrawn depends largely on the degree to which the intrathecal pressure is increased.

Normally, in health, the cerebrospinal fluid issues from the needle drop by drop, but in cases of meningitis one often gets quite a jet or fountain of fluid. Allow this to flow until the pressure is reduced to normal. Negative pressure, by suction with a syringe, should never be employed. *James Purves Stewart.*

2. **Epidemic Cerebrospinal Meningitis.**—The patient should be kept quiet in a darkened room. Great care must be exercised in order to avoid bed-sores, which are particularly prone to form rapidly. A certain amount of restraint is necessary in delirious cases. It should be applied by methods recommended in the article Fevers, Acute Infectious. The joints should be wrapped in cotton-wool lightly bandaged on. In most cases nerve-sedatives are called for, and of these the most efficacious are morphia and opium. Large doses of these drugs can be tolerated in this disease; 40 min. of laudanum every hour; or 7½ gr. of opium at the beginning, and 1 gr. every half hour; or morphia hypodermically in doses of ¼ to ⅓ gr. at intervals of a few hours. Opium or morphia appears to be most beneficial when administered very early in the illness. As the patient becomes drowsy, the dose must be diminished, or the administration stopped. In cases where there may be any objection to opium, potassium bromide or chloral hydrate may be used. The following mixture will be found useful:—

℞				
	Potassii Bromidi Chlorali Hydratis	āā gr. cxx	Extracti Cannabis Indicæ Hyoscyaminæ Elixir Simplicis	āā gr. j q.s. ad ℥j

Of this mixture, a child of three is given 10 to 15 min. every twenty minutes until profoundly under its influence, and the dose must be repeated as soon as there is either moaning or restless movement of the limbs. The dose for an adult is half a teaspoonful, administered in the same manner.

Most authorities agree that counter-irritation to the spine and back of the head is a valuable measure; so that blistering, or rubbing the spine with stimulating liniments such as camphor liniment, or mustard poultices, may be employed. It is not desirable to blister deeply; frequent flying blisters are preferable. Cold should be applied to the head, either by means of crushed ice in a flannel or cotton cap made in two layers, or by iced water running through an aluminium coil. In severe cases hot packs or baths (water at 104°) for fifteen or twenty minutes, two or three times a day, are extremely useful for the relief of pain, hyperæsthesia, insomnia, and delirium. The bowels should be kept freely open by castor oil or calomel. Stimulants are to be employed when the state of the heart requires them. In severe and prolonged convulsions chloroform should be given. The diet is that of the febrile condition: small quantities of easily digested nourishment given frequently.

Removal of some of the cerebrospinal fluid by *lumbar puncture* is a method of treatment that has been recognized for a considerable time. This operation must frequently be performed in order to obtain fluid for the purpose of diagnosis; it can, therefore, be made use of at the same time as a therapeutic measure.

A general anæsthetic should be given when necessary (e.g., if the patient is delirious, if there is pronounced hyperæsthesia of the skin of the lumbar region, and in the case of children); in other cases a local anæsthetic may be used, unless the patient is comatose, when none is required.

The skin at the site of puncture should be thoroughly cleansed and painted with iodine. An ordinary exploring syringe will suffice for making the puncture and drawing off the fluid. The needle should be strong and have a fairly wide bore. The whole apparatus should be sterilized. The patient should lie on one side with the spine flexed as much as possible, the head and shoulders being bent downwards and the thighs flexed sharply on the trunk. The puncture should be made between the third and fourth or fourth and fifth lumbar vertebræ. If there is any difficulty in defining these spaces, a line should be drawn from the highest point of one iliac crest to the highest point of the other, and the puncture made where this line crosses the spine. In children the puncture should be made in the middle line, but in adults it should be made slightly outside it. The needle should be inserted steadily, slowly, and slightly upwards, to the depth of 1½ in. in children, and about 3 in. in adults. The fluid must be allowed to flow out of its own accord. If it is very thick the needle may have to be cleaned now and then with a sterilized stilette or piece of wire. When it cannot flow because of its thickness, slight suction may be applied by the syringe. In such cases, too, the lower part of the spinal canal should be washed out gently with warm normal saline solution before injecting *curative serum*. For though lumbar puncture alone is a valuable measure in certain cases, it should be only a preliminary to the injection of serum whenever this can be obtained.

To inject the serum, the barrel of an ordinary antitoxin syringe (such as Roux's) should be attached by three or four inches of indiarubber tubing to the needle or cannula which has been inserted into the spinal canal. The serum, previously warmed in a water-bath to the normal temperature of the body, should be poured into the barrel and allowed to flow into the spinal canal by its own weight. If pressure by the piston be necessary, it should be applied equally and very slowly. During the injection the lower part of the patient's body should be raised by elevating the foot of the bed; and this position should be maintained, when possible, for an hour afterwards.

The average dose of serum is 20 to 25 c.c. in adults, and somewhat less in children. Occasionally it may be 30 to 40 c.c.

Should any of the following symptoms occur during the injection: stupor; shallow, irregular, slow, stertorous respiration; dilatation of the pupils; incontinence of urine and fæces; the injection should be stopped and fluid allowed to flow from the canal by lowering the barrel through which the serum is being introduced. Epinephrin in large doses should be injected intramuscularly. If the lumbar puncture has failed to withdraw fluid from the spinal canal ('dry puncture'), serum may still be injected, but the injection must be done very slowly, and if possible by gravity alone.

The injection of serum should be repeated daily till there is some improvement in the patient's condition, which will usually take place within four days. It should be repeated also if any symptoms of a relapse occurs.

The serum should be one prepared by means of the strain or strains of the prevailing epidemic.

It is advisable to perform lumbar puncture and to allow the cerebrospinal fluid to escape, even when no curative serum is immediately available. For undoubtedly certain cases, especially those in which there are marked symptoms of intracranial pressure, receive benefit from this treatment. In purulent cases (again when the curative serum is not at hand), a 6 per cent solution of lysol should be injected into the spinal canal to the amount of the cerebrospinal fluid withdrawn. Good results have also been obtained by the administration of hexamine by mouth in 10-gr. doses every four hours.

In cases in which injection of serum by lumbar puncture has failed to give relief, and symptoms indicative of intracranial pressure still persist, it is very likely that the serum is prevented by accumulation of exudate from reaching the cerebral meninges and ventricles. In such cases it is justifiable to inject serum straight into the lateral ventricles. In order to reach a ventricle of an infant, the needle is made to enter at the corresponding angle of the anterior fontanelle. The needle, which should be about 8 cm. ($3\frac{1}{4}$ in.) in length, is introduced downwards and towards the median line at an angle of about twenty degrees to the depth of about 4·5 cm. ($1\frac{3}{4}$ in.). Fifteen to twenty c.c. of fluid should be allowed to flow out, the ventricles should be irrigated with normal saline solution at a temperature of about 105°, the excess of this fluid should be allowed to run off through the needle, and finally 15 to 20 c.c. of serum should be slowly injected. When the fontanelle is closed, the bone should be exposed over the second frontal convolution 3·5 cm. ($1\frac{3}{8}$ in.) from the middle line, and should be penetrated by a Doyen perforator, followed by a burr, which leaves a cup-shaped fossa and exposes the dura mater sufficiently for the operator to see whether any large vessel is present at the spot. The ventricle can be reached by inserting perpendicularly into the second frontal convolution, for a depth of 4 to 5 cm. ($1\frac{1}{2}$ to 2 in.), a hollow exploring needle with a blunt point and openings at the side.

Injection of serum into the ventricle should be repeated every day or two until improvement is observed.

A *vaccine* (prepared by isolating the meningococcus from the patient's own cerebrospinal fluid and killing it by heat) has been employed in a few cases. But this treatment appears to be suitable for chronic and relapsing rather than for acute cases. The dose should be 20 million cocci, increased up to 500 or 1000 at intervals of two or three days. There is experimental evidence to show that a vaccine would be very useful as a prophylactic in epidemic times. (*See also* SPECIFIC THERAPY.)

The patient may be allowed out as soon as he is well enough.

Carriers can be freed from meningococci by inhaling vapour containing chloramine (1 to 2 per cent) from fifteen to twenty minutes, or of zinc sulphate (1 per cent) for five minutes, in a closed chamber of 700 to 750 cubic feet capacity. The vapour is atomized by means of a steam spray. It may be necessary to repeat the inhalations for several days.

Quarantine period: one week. *E. W. Goodall.*

3.—**Syphilitic and Tuberculous Meningitis and Meningo-encephalitis.**—Treatment of the *tuberculous* variety of meningitis offers little prospect of success. One should, however, employ the general measures already described. In addition, mercurial inunction of blue ointment to the abdomen, or administration of mercury by the mouth, is advisable. Repeated lumbar puncture relieves the intracranial pressure, if the communicating channels between the cranial and spinal ponds be not already closed by adhesive meningeal inflammation.

In *syphilitic* cases the prospect of recovery is much brighter. Both mercury and iodide of potassium should be pushed energetically, together with salvarsan and neosalvarsan. Iodide of potassium may be given in doses of from 10 to 20 gr., three times a day. Mercury may be given by the mouth in full doses, say 1 drachm of the liquor hydrargyri perchloridi three times a day, or by inunction of a drachm of blue ointment daily, or by intramuscular injections of a soluble mercurial salt. For this purpose it is convenient to give 1 c.c. of a 1 per cent aqueous solution of benzoate of mercury twice or three times a day, according to the severity of the case.

With regard, however, to treatment by salvarsan or neosalvarsan, we must be careful, as in all cases of cerebrospinal syphilis, to avoid maximal doses. It is prudent to give

doses not exceeding half the maximal amount, i.e., 0·3 grm. of salvarsan (instead of 0·6 grm.), 0·45 grm. of neosalvarsan (instead of 0·9 grm.) intravenously, repeating the dose at intervals of about a week for five or six successive weeks, until the cerebrospinal fluid loses its lymphocytosis and its globulin, and until its Wassermann reaction becomes negative.

The efficacy of intravenous salvarsan or neosalvarsan treatment may sometimes be enhanced by the intrathecal administration of the patient's own salvarsanized serum, according to the following method: An hour after the intravenous administration of salvarsan or neo-salvarsan, when the patient's blood is presumably abounding in syphilitic antibodies, a sufficient amount of blood (about 40 c.c.) is withdrawn by venipuncture to yield 12 or 14 c.c. of blood serum. The blood is centrifuged, to get rid of the corpuscles (which, if injected into the cerebrospinal fluid, would undergo hæmolysis), and is diluted to a 40 per cent mixture with freshly-made, sterile, normal saline solution. This dilute serum is kept for half an hour or longer at a temperature of 56° C., and is then ready for injection. On the day following the salvarsan injection, 35 to 40 c.c. of this dilute serum are injected intrathecally—previously withdrawing a corresponding amount of cerebrospinal fluid, partly to lower the intrathecal pressure and make room for the serum, and partly for control observations upon the cerebrospinal fluid with regard to its cytology, the presence of globulin, and the Wassermann reaction. This combined salvarsan and serum treatment may be repeated once a week for a number of weeks, the duration of treatment being guided not only by the clinical signs and symptoms, but also by the systematic examination of the cerebrospinal fluid. *James Purves Stewart.*

4. **Posterior Basic (Simple Basal) Meningitis.**—This form of meningitis, almost exclusively met with in young infants, is to be regarded as a sporadic form of epidemic cerebrospinal meningitis, and is produced, like it, by the meningococcus.

If the disease be diagnosed within the first week, lumbar puncture should be performed and antimeningococcus serum injected (see above). After this period the serum is of no avail, but a vaccine should be prepared, if possible from the cerebrospinal fluid, and vaccine treatment begun as soon as possible, an injection being given every third day. (*See* SPECIFIC THERAPY.)

In addition to this, which is the specific treatment of the disease, repeated lumbar puncture (q.v.) is of use in relieving intracranial tension and lessening head retraction and vomiting. It may be repeated with advantage every three or four days. The fluid should be allowed to flow until it begins to come only in drops.

Treatment by drugs is of no use except to meet special symptoms; bromides, for example, may be required for restlessness or convulsions, and opium for pain. Mercurial aperients are useful. The nose and nasopharynx should be kept clean by washing out with an alkaline lotion (e.g., borax, 2 gr. to the ounce), and if the ear-drums are bulging, they should be perforated and a boric lotion used twice daily for irrigation.

Careful nursing is of great importance, and it may be necessary to feed by the nose tube for long periods. *Robert Hutchison.*

MENOPAUSE.—For the nervous and vasomotor disturbances of the menopause (headache, flushings, perspirations, etc.) bromides are the most efficient remedy, e.g.:—

℞	Potassii Bromidi	ʒj–iss	Tincturæ Lupuli	ad	ʒiij
	Tincturæ Sumbulis	ʒiij	Aquam Camphoræ	ad	ʒvj

One tablespoonful after each meal.

The following is also a useful prescription:—

℞	Ammonii Bromidi	gr. x–xv	Tincturæ Nucis Vomicæ		♏iv
	Spiritus Ammoniæ Compositi	♏xx	Infusum Gentianæ Compositi	ad	ʒss

Before each meal.

Ichthyol in 3-gr. doses in capsule is also serviceable. Ovarian preparations have proved disappointing. *Robert Hutchison.*

MENORRHAGIA and METRORRHAGIA.—These may be considered together for the purpose of this article. It must be remembered that menorrhagia and metrorrhagia are symptoms and not diseases, and that a diagnosis of the cause of the bleeding must be made before any rational treatment can be adopted. One should never treat unusual bleeding without an examination, except in young unmarried girls in whom the history precludes the possibility of pregnancy. In menorrhagia or metrorrhagia occurring in older women, whether married or single, it is impossible to over-emphasize the importance of making a vaginal examination, and, if necessary, a bimanual examination. Carcinoma of the cervix or of the body of the uterus may be present without causing any symptom besides bleeding—there may be a complete absence of pain, wasting, or any foul-smelling discharge—and neglect to make a local examination may deprive the patient of her only chance of cure.

An increased amount of bleeding is common in young girls at, or soon after, the time of puberty. The patients are usually anæmic, and often undeveloped. Improvement of the general health by the administration of iron and by the removal of the causes of the anæmia, e.g., long hours of employment indoors, constipation, and dyspepsia, usually brings about a cure. In some cases rest in bed is necessary, and is usually efficacious. One of the most useful drugs is lactate of calcium, 30 gr. of which may be given in a tumblerful of water every other evening. Ergot is generally of little use in such cases. 'Styptol' (cotarnine phthalate) in doses of $\frac{2}{3}$ to 1 gr., three or four times a day, is much more likely to prove successful. Cannabis indica, which may be given in doses of $\frac{1}{4}$ gr. of the extract three times a day, is sometimes useful.

In older girls frequent causes of menorrhagia with no abnormal physical signs are found in mental strain, worry, assumption of responsibility for the first time, etc., and in occupations involving long hours of standing. In these cases, rest, calcium lactate, styptol, and iron are to be advised.

In cases where early pregnancy is diagnosed or suspected, the possibility that extra-uterine pregnancy is the cause of the bleeding must never be forgotten.

After miscarriage or labour, if the uterus, though enlarged, does not seem to contain any retained portion of the ovum, ergot, rest, and hot douches will be sufficient treatment. If, on the other hand, the uterus is not only bulky but seems likely to contain some portion of the ovum, the cervix should be dilated and the uterine cavity explored with the gloved finger. If no definite piece of placenta can be found, the endometrium should be curetted.

Increased frequency of the monthly periods does not necessarily call for treatment. If the flow, though occurring more frequently than normally, is not too free and has no deleterious effect on the general health, no special treatment is required.

'Erosions' of the cervix may cause a blood-stained discharge. After making certain that the 'erosion' is not an early carcinoma, by testing its friability, etc., and, if necessary, by microscopical examination of an excised portion of tissue, the treatment will consist in rubbing it with silver-nitrate stick, or swabbing it with pure carbolic acid or iodized phenol. If the erosion bleeds readily, bimanual examination may reveal the fact that the patient is pregnant.

Mucous polypi of the cervix should be twisted off with a pair of blunt forceps, such as ovum forceps. An anæsthetic is not necessary except in the case of a very nervous patient. When a middle-aged or elderly woman who complains of unusual bleeding is found to have a mucous polypus of the cervix, the attendant should not be content with removing this, but should keep her under observation, and, if the bleeding persists or recurs, should dilate the cervix and explore the interior of the uterus.

The fact that a patient with uterine fibroids has arrived nearly at the time when the menopause may be expected does not necessarily contra-indicate an operation. Atrophy of large fibroids after the menopause is rare, and degeneration is common. Unusual bleeding at the time of the menopause must never be diagnosed as being due to the menopause until every other possible cause has been excluded. Carcinoma of the uterus is particularly common at this time of life. Recurrence of bleeding after a more or less prolonged period of amenorrhœa in a patient who is known to have uterine fibroids should always arouse the suspicion that there may be malignant disease of the endometrium. Any irregularity, ulceration, or new growth of the cervix must be investigated by the aid of sight and touch, assisted, if necessary, by microscopical examination. If there is any

suspicion that there may be malignant disease of the body of the uterus, the condition of the endometrium must be investigated, after dilatation of the cervix. The treatment of carcinoma of the uterus, involving major operations, is outside the scope of this book.

It is well to remember that a hydatidiform mole may occur at about the time when the menopause is expected, and that the history in such cases is often misleading, so that pregnancy may not be suspected until an examination is made.

Excessive bleeding at the time of the menopause, when no local cause can be found, may be treated by rest, ergot, bromides, and hot douches. Ergotine in pills is sometimes not so efficacious as is the liquid extract of ergot in an acid mixture, such as :—

℞ Liquoris Strychninæ	♏ iij	Syrupi Zingiberis	♏ xxx
Acidi Hydrochloridi Diluti	♏ x	Aquam	ad ℥ j
Extracti Ergotæ Liquidi	♏ xxx		

Two tablespoonfuls to be given three times a day.

One need not be afraid to employ iron during the occurrence of unusual bleeding from the uterus. It is often the most useful drug that can be given. (*See also* Hæmorrhage, Uterine ; and Fibroids of Uterus.) *H. Russell Andrews.*

MENSES, RETENTION OF.—(*See* Amenorrhœa.)

MENTAL DEFICIENCY IN CHILDREN.—With regard to the treatment of these cases, two general statements may be made :—

1. In the vast majority the condition is, strictly speaking, incurable, in the sense that children who are mentally weak to begin with will remain so to the end, whatever is done.

2. There are few mentally deficient children, however, who are not capable of great improvement under suitable treatment.

These two statements are equally true, but the latter is much the more important as a basis of action.

It is a great mistake to suppose that the imbecile, because he cannot be cured ' tuto, cito, et jucunde ', is therefore outside the sphere of the medical practitioner. Indeed, he is one of the very few members of the community who should rank as a patient from his birth to his death. If his mother gets no help in her management of him from her medical man, she is not likely to get it from anyone else. It is obviously the doctor's duty to lessen as much as he can the suffering caused by the presence of an imbecile in a family. With this end in view, he has to treat both the child who is causing the suffering, and the parents who are feeling it.

When a baby is mentally defective and his parents do not know it, the first question that arises is : Are we to tell them ? If they ask plainly, they must, of course, be told the truth. If, however, as often happens, they ask no direct questions (either from ignorance or because they are afraid of the answer), it is usually far better to tell them nothing. There are two reasons for this : (1) A very large proportion of imbecile babies die early. When this happens, it is clearly well for all concerned when the child's defect has remained a secret known only to the doctor. (2) The parents usually know nothing about the subject of mental defect. When this is so, a sudden intimation that it is present in their child, if made before their own observation has prepared them to receive it, is apt to produce unsatisfactory results. They either refuse to accept it, or, if they do so, it causes such discouragement as to paralyze their efforts for his improvement.

Whether the parents realize the significance of their child's backwardness or not, the main thing is that they should turn their attention actively to what can be done to improve him. It is by trying to make him do things better that they will come to see the true state of the case. They should, however, be told plainly that the expectation of sudden unworked-for recovery at seven, or fourteen, or any other age, is an utter delusion.

The extent to which mentally defective children benefit from treatment, and the best treatment to employ, vary, of course, greatly, according to the degree of the defect and the nature of the case. In many forms of the condition, the improvement under bodily and mental culture is remarkable. In the lowest type of idiocy, no treatment, beyond general mothering, may be possible. And there are cases (e.g., of epileptic and syphilitic dementia) in which any attempt to train the mind will only aggravate the child's condition.

The object of our treatment, so far as the child is concerned, is to make him as happy and as good as possible. As his happiness will largely depend on how many things he can and does do and notice, and on how he commends himself to others by his behaviour, our chief aim must be to make him more capable and likeable. We must also try to give him some sense of duty, proportionate to his intellect, and to show him that his duty lies in doing things that he is quite able to do.

What follows refers chiefly to young children (under five or six years). It is mainly at first that the mothers require assistance; and the treatment cannot be begun too early.

The main indications for treatment may be stated as follows :—

1. *Attend to the General Health.*—This includes the giving of good plain food suited to the child's powers of mastication, attention to the bowels, much open-air exercise, frequent baths, and especially warm clothing, for the child will always be duller if he is feeling cold.

If epilepsy or cretinism be present, their treatment is, of course, to be seen to. It is also important to treat such conditions as rickets, anæmia, tubercle, and dyspepsia, which may greatly interfere with the child's mental, as well as with his bodily, vigour.

Local defects, such as refractive errors, adenoids, and contracted tendons, are often well worth attending to in these children; and massage is frequently, but electricity only rarely, useful.

Craniectomy has proved useless, and to what extent surgical operations for chronic hydrocephalus may be of benefit to the intellect is not yet settled.

2. *Awaken the Child's Faculties, (a) Bodily, and (b) Mental.*

a. He must be encouraged in the voluntary use of all his muscles regularly and carefully. Such exercises are not only good for improving his strength and co-ordination, but are also helpful in stopping the purposeless automatic movements which so many of these children have. Musical drill, dumb-bells, ball games, skipping, bean-bags, walking between the steps of a ladder, nail-boards, threading beads, and all sorts of kindergarten occupations, are useful for the older and more intelligent of the children, as well as singing and reciting. For young children and those who are less capable, various very simple actions, such as clapping hands, or playing with a rattle, may to some extent answer the same purpose.

It is important to teach the child chewing if possible; and if he dribbles, his lips may be strengthened by exercises, such as holding a flat piece of wood transversely between them for a given time, and by blowing whistles, trumpets, etc.

b. Teach him to notice things and to compare their characters—roughness and smoothness; hardness and softness; heaviness and lightness; heat and cold; colours; shapes (circles, squares, triangles, spheres, cubes, cylinders, etc.); distances; sounds (musical and other); tastes and smells. Take him out, or to the window, and let him see the people, horses, dogs, cars, etc. If objects do not attract him, perhaps bright light and colours will. Find out what arouses his attention, and let him have it. Encourage him to look at, listen to, and handle anything that he is taken up with. Any sort of interest will help to brighten him.

3. *Encourage him to use his Awakened Faculties in giving himself Pleasure.*—Remember that he needs to be taught to do many things which normal children do of their own accord without teaching. Incite him to try to do things; and, at first, plan easy successes for him. If he deliberately wants a thing, tries to get it, and succeeds, this is a most valuable and a very pleasant lesson for him. In the case of a baby, if he likes a noise, give him a key and a pot-lid and let him make it for himself. Never let the mother or nurse go on doing for the child anything that he can be made to do for himself. For most mentally defective children mere memory knowledge is of little use, but the more things they can do, the better for them.

4. *Promote Self-control.*—This is of immense importance, and very difficult. It includes a number of things. There is, firstly, keeping himself clean and letting his mother know when he requires to be attended to. Some mentally defective children cannot be taught cleanly habits at all. A great many, however, who seem to have complete incontinence in early childhood, may, with persevering training, become quite normal in this respect in time. General personal cleanliness, and tidiness in person and dress,

are also constantly to be insisted on. The acquisition of good manners, including good temper, is of far more consequence to the child in most cases than that of reading or writing, and the ability to speak nicely and to use a knife and fork like other people is an invaluable accomplishment. Another point of great importance is that bad habits of all kinds, to which these children are particularly prone, must be watched for and checked at their earliest beginning. This applies not only to such things as masturbation, thumb-sucking, and dirt-eating, but equally to little tricks of manner and expression (grimacing, unpleasant noises), which do the children much harm by drawing attention to their defect and making them objectionable to others. Thoroughness in everything, so far as it is practicable, is of inestimable importance. The mother must never acquiesce in the child's doing less than his best because he is weakly.

5. *Cultivate the Moral Character.*—Prompt obedience is as all-important in the education of character in mentally defective as it is in ordinary children. Ideas of justice, honesty, truthfulness, affection, modesty, unselfishness, and gentleness to younger children and to animals can and should be inculcated. If we exclude some rare cases of so-called 'moral imbeciles', we may say that there are few mentally defective children who have not some sense of right and wrong to develop.

6. *Encourage the Child's Affection.*—Always cultivate every proper feeling of liking to others that he is capable of. To be liked by others is one of the important sources of human happiness ; but another, which is even greater, is affection felt for others. Nothing brightens a child's life like having many objects of love, whether they are human beings or only animals and dolls.

Institution Treatment.—If the home is comfortable and well conducted, it is generally far the best place for the mentally defective child, during the first five or six years of life at least. After that, if he is educable, there are usually great advantages in sending him to an institution. In discussing what is to be done with the child, we have to bear in mind his home conditions, his present needs, and the arrangements that are likely to be possible for his future care.

1. *Home Conditions.*—The interests of the parents and the other children have to be considered, as well as those of the child. Although his presence in the house may do no harm to his brothers and sisters, his care often makes such demands on his mother's time and energies, that she cannot give enough attention to the rest of the family. As the mentally defective child grows older, the association with his normal playmates is a constant source of discouragement to him, because he finds himself hopelessly inferior to them at every turn. He also cannot usually have at home the freedom and open-air exercise which he needs for his health and happiness. The home difficulties likewise entail a constant strain on the mother's nerves ; and this reacts on the child and makes him more restless and difficult to manage.

2. *His Present Needs.*—All mentally defective children need protection from the difficulties, dangers, and distresses of life ; and as they grow older it becomes increasingly difficult to guard them against these. The skilled mental, physical, and manual training which is necessary, especially for higher-grade cases, to develop their intelligence, to increase their initiative, and to brighten their lives by making them more like other children, can in most cases be far better provided in an institution than at home. Life in a special residential school has also the great advantage that it allows the child to associate on equal terms with companions like himself, and to have the great and wholesome pleasure of excelling some of his playfellows in something or other. The parents' anxiety lest their child should be deteriorated by living with others less intelligent than himself is quite groundless in a well-ordered institution.

Daily attendance for a few hours at a special school has a very small influence for good on a mentally defective child, compared with that of residence in an institution.

3. *His Future Needs.*—Even where the home conditions seem ideal during early childhood, it may be far the best and kindest thing to send the child early to an institution, unless it is certain that it will always be possible to have him properly looked after at home or with friends. While he is young, he will probably soon learn to live happily under new rules and restrictions ; but this will be very difficult for him if he leaves home for the first time when he is older and his habits have become more formed.

John Thomson.

MENTAL DISEASES.—Any practitioner may be called on to carry out the treatment of a case of mental disease under home conditions, without the aid of a specialist or the facilities of a mental hospital. This task is often one of great difficulty and responsibility, and it raises considerations which do not occur in the treatment of other diseases, or are of special importance in the treatment of mental disorders.

RECENT DEVELOPMENTS IN PSYCHOLOGY.

Recent advances in psychology and neurology have been the means of effecting a much more intimate alliance than hitherto of mental with nervous diseases, and of both with other diseases of the organism. They have also served to give prominence to the conception of the essential dynamic nature of all physiological and pathological processes in the nervous system and mind, such processes being regarded as the result of the action and interaction of the fundamental instinctive forces of the organism. It is possible to refer here only in briefest fashion to the trend of these developments, which indicate in particular the growing importance to the practitioner of a knowledge of medical psychology.

Although the brain is the 'organ of mind', and neuronic and other cerebral changes accompany and subserve its 'function' of mentation, our knowledge of both the physiological and the psychological changes is far from complete ; and still more imperfect is our knowledge of their immediate relation to one another, that is, of the actual physiological changes which correspond to definite psychological happenings. Physiological and psychological occurrences, and the terms descriptive of them, belong to entirely separate categories, and they must not be confounded with one another. Neurones and brain changes must not be confused with thoughts, feelings, and volitions ; and although it is sometimes difficult in the two sciences to avoid using terms which seem to mean the same thing—note especially the use of the term 'energy'—it must be clearly kept in view that the terms of physiology have solely a physical and chemical significance, and those of psychology a purely psychical meaning.

Integration.—The human being is a biological and social unit, whose several parts are integrated by means of the nervous system at successively ascending levels, the object of each integration being to aid the various parts of the organism, and the organism as a whole, in the increasingly complex process of adjustment with environment, and so, in the working of the organism towards higher ends, to make upward progress possible. The integration of the human unit is effected at three main levels. At the *lowest* level, the vegetative nervous system, sympathetic and autonomic, integrates the fundamental biological machinery subserving nutrition, metabolism, growth, development, and decay, by regulating the involuntary movements and secretions of all organs and tissues containing unstriped muscle or glandular epithelium, and by being at the same time responsive to the action of the chemical regulators of metabolism ; thus, sympathetic end-organs are stimulated by the hormones of chromophile glands, e.g., adrenalin, and autonomic end-organs by the hormones of tissue metabolism, e.g., cholin. At the *intermediate* level, the sensorimotor nervous system, comprising the whole of the cerebrospinal system except its highest centres, by the successive aggregation of reflexes, integrates the motor machinery of the various parts of the body and of the body as a whole, thereby facilitating harmonious performance of movements in meeting the demands of the lower vegetative system, and the inception of other and higher activities. At the *highest* level, the psychic nervous system, represented by the highest centres of the cerebral cortex, not only integrates the various parts of the organism into a biological unit or individual, but also, at its supreme or conscious level, it relates the individual as a whole to his environment, and especially to his social environment, and regulates his conduct.

Mentation.—The lowest unicellular organisms, such as the amœbæ, inasmuch as they are sensitive, irritable, and contractile, and also automatic or spontaneous in their movements, exhibit what may be regarded as elementary manifestations of knowing, feeling, and willing, and so probably have something akin to an 'awareness', 'consciousness', or 'mind', of their own. In the highest multicellular organisms, such as man, the most 'conscious' cells are the neurones ; and in the various groups of neurones from lowest to highest level of the nervous system, the 'consciousness' of each group is the combined 'consciousness' of its constituent neurones, but does not form part of the consciousness of the individual as a whole until the upper levels are reached, namely, from the cerebral cortex downwards to at least the basal ganglia, the optic thalamus being now known to subserve consciousness of crude common sensations, and of feelings of pleasure and discomfort. The individual is conscious only of some of the phenomena accompanying the activity of the neurones at the upper levels of the nervous system ; but he is unconscious of the evidences of many nervous operations occurring there—for example, sensations, percepts, and ideas which are not registered in conscious memory, also forgotten incidents and situations, just as he is similarly unconscious of nervous functions going on at lower levels, such as reflex action. Reflex action itself, however, is characteristically purposive or adaptive, the nature of the movement in response to the stimulus being as a rule useful to the organism. The reactions to environment exhibited by the simplest organisms are of the nature of specific responses, the actions taking place in definite ways in response to definite stimuli, and they are identical in type with reflex actions, and yet in many cases cannot be differentiated clearly from instinctive, that is, psychical, actions. In the evolution of animal behaviour, as subserved by the successive steps of

nervous integration, reflex actions merge insensibly into instinctive, and instinctive into conscious actions. As regards the immediate site of conscious mentation, the hypothesis has been advanced that this occurs at the synapses of the higher cortical neurones, consciousness arising whenever resistance at the synapses is overcome by the flow of surcharged nerve energy from one set of neurones to another.

Energy.—Apart from the question as to how far consciousness, or rather its material basis, extends down the nervous system, and the occurrence of mentation below the plane of consciousness as ordinarily understood, that is, of the consciousness of the individual as such, another feature of special significance in modern neurology and psychology is that of the 'energy' which is necessary for the production of neuronic and of mental activity. Every neurone has its store of energy, or power of doing work, this form of energy being known under various names, corresponding to the kind of work carried out by the neurone—or to the choice of term employed by different authors—such as nervous or psychic or mental energy, nerve-energy, mind-energy, neurokyme, libido, horme, or simply life-energy, with its two distinct components, self-preservative and race-preservative, proceeding from the fundamental forces or principles of vitality and immortality. This is the 'energy' of the living nervous system, and of the instincts, emotions, and desires which constitute the driving power of mental life. Like physical energy, nervous energy may be either potential or kinetic, and when it accumulates in and gradually surcharges a neurone it overflows into other neurones at its synapses with them, taking the line of least resistance, and so tending to flow more freely into those neurones which have been in the habit of receiving previous overflows. This process goes on continuously from neurone to neurone throughout the nervous system, the nervous energy ultimately finding an outlet by being converted into some form of organic activity or work, e.g., muscular, secretory, sensory, motor, mental. It would seem impossible for us not to acknowledge that the energy of the nervous system at its supreme level eventuates in the symbolic forms of ideas, feelings, desires, volitions, and the like. No one can deny that, just as excessive work of any kind ends in time in exhaustion, essentially nervous exhaustion, so does excessive mental work end in time in mental exhaustion.

Conscious versus Unconscious Mind.—At the highest or psychic level of the nervous system, the tendencies of the various parts of the organism are so 'integrated' as to form the tendencies of the whole individual, that is, the instinctive tendencies which express the organism as a whole, and at the conscious level are expressed in the form of inclination or wish. As the unit of psychological experience of the individual, wish is coming to occupy in modern psychology much the same position of importance as was formerly accorded to sensation. In every animal the two main primitive instincts are to preserve its own life and to propagate its own kind, and all the instincts of the individual animal as such contribute towards the realization of one or other of these personal or selfish ends. In the struggle for existence many animals are unable to accomplish such ends except by combining with one another for their mutual protection from their enemies, and this compelling tendency to act as a member of the herd, and to conform to its ways, constitutes the third great primitive instinct with which all such gregarious animals are endowed. In man, the most gregarious and social of animals, the altruistic ways of the herd, the wishes, customs, and conventions of society, are often opposed to his personal inclinations and motives, his herd or social instinct being thus brought into conflict with his other primitive instincts as an individual. In normal civilized man the social instinct is predominant ; in other words, in order to conform to the social and moral code of his fellows, he has to repress his individual instincts of self-preservation, self-advancement, and self-propagation, the conflict with which under modern conditions is always tending to become keener, and, according to many psychologists, is keenest in the case of the last-mentioned or sexual instinct. The instincts are the sources or springs of all human activities, supplying their driving power, and largely determining their ends, but they are subject to the guidance and gradually increasing dominance of the higher characters of the mind, such as self-consciousness, reasoning, imagination, sentiment, moral sense, and self-control, which have been slowly acquired in the ever-ascending process of mental evolution and distinguish the mind of man from that of all lower animals. The instincts and their material basis form the psycho-physical foundation of the mental machinery, and consist of certain inherited and innate specific mechanisms, tendencies, and forces, which, in the case of each instinct, make the individual take cognizance of certain objects or situations, experience some particular emotion aroused thereby, and act, or inclined to act, in some appropriate manner. Instincts, emotions, and desires, which are characteristically non-rational and largely unconscious, constitute the basal and main part of the activities of the mind, the later developed and higher characters forming, relatively speaking, but a small and superficial portion of the whole, though of paramount importance in the mentality of man.

When a human being experiences a desire or wish which cannot be satisfied, usually owing to its being in opposition to the social instinct and the moral code, he normally faces the situation frankly, makes a conscious effort, more or less successful, at efficient relation with reality, finds an outlet for the wish in some useful form of activity, and retains his peace of mind. If, however, the wish cannot be dealt with in this way, it is disturbing and disagreeable to the harmony of the mind, and, in order to secure the latter desideratum, the individual blinds himself to the necessity for adjustment with reality, and adopts some palliative or compromise. Thus, he may intentionally suppress his instinct for the welfare of others, and abandon himself to the selfish and unsatisfactory course of an unconventional, immoral, or criminal life. Or again, not going to this extreme, he may give free play to his social instinct, but also satisfy the conflicting wish from time to time, intentionally 'dissociating' or 'splitting off' the latter from the rest of his consciousness and personality, and keeping them in more or less separate compartments, and so play the rôle

of the double life, perhaps devoting himself to charitable, religious, and other forms of social work as a set-off against his discreditable actions ; and further, owing to the inherent craving of the mind for rationality, by means of a fictitious logical process of self-deception or 'rationalization', which so distorts the remaining links between the opposing desires as to conceal their incompatibility, he finally squares his ethical principles to his immoral actions, fails to recognize the inconsistency present, and so maintains his peace of mind. Another, and more frequent, alternative open to the individual who cannot attain satisfaction of his wishes, and so experiences mental disharmony and discomfort, is to take advantage of the common tendency of the mind to avoid or ignore such disturbing desires, and to banish them from consciousness ; in other words, he 'represses' them from the conscious into the unconscious, with the result that he forgets them, in time permanently. But although such desires are repressed and forgotten, and so unrecognized by the individual, who is unconscious of them, the important features about them, according to the modern view, are that they remain active, and the more so, the more the emotional tone they contain ; that they constantly try to make their way into consciousness ; that they are prevented from doing so by some agency analogous to inhibition, or by a supposed resistive and obstructive barrier (the 'censure' or 'censor') ; and that they must eventually gain an outlet in some form of activity (the 'abreaction'). The original outward conflict with reality, which the individual experienced when he was unable to attain fulfilment of his wish, thus becomes, by the process of repression, an inward 'conflict' between the conscious and the unconscious. This gives rise to a harmful condition of mental tension, which must be relieved. The 'energy' of the repressed wish gradually accumulates, impairs the mental balance and stability, and eventually finds expression in some unusual form of mental manifestation or conduct, which is not recognized by the individual as having any connection with the original and now long-forgotten wish, which may or may not be useful to him or to society, and which frequently impairs his efficiency as an individual.

Desire is experienced by the infant soon after birth, although the discrepancy between wish and fulfilment is at first slight, its nutritive and other requirements being readily satisfied. As the infant develops, and comes more and more in touch with environment and reality, desires become more numerous and more difficult of attainment, and the discrepancy between wish and fulfilment becomes correspondingly greater, until the infant comes to recognize the necessity to postpone the satisfaction of desire, and to adjust himself and his conduct to the requirements of the world and society around him. This process of adaptation, with its accompanying conflicts and repressions, begun in early infancy, and ever increasing in complexity, continues throughout development and later life.

According to the new psychology, therefore, the mind comprises, as it were, from the surface inwards : (1) The conscious, or part immediately known to the individual as the mind, the so-called content, field, or stream, of consciousness ; (2) The subconscious (or foreconscious), consisting of the temporarily inaccessible, but readily revivable, material of former and relatively recent experience ; and (3) The unconscious, consisting of material normally inaccessible to consciousness, namely : (*a*) Secondary unconscious, or ontogenetic elements, the numerous repressed desires and ideas of former personal experience, especially those of infancy and early development, but also those of later life ; (*b*) Primary unconscious, or phylogenetic elements, the instinctive modes of feeling and thinking inherited from primitive and proximate ancestry.

The various elements of the mind (cognitive, affective, and conative) in each of its conscious, subconscious, and unconscious portions, tend by association to group themselves into systems, each with its characteristic trend of thought, feeling, and activity. A system of associated ideas, with a strong emotional tone, and a tendency to find expression in actions of a particular type, is known as a 'complex'. Complexes are resultants of the action and interaction of the instincts with environment during education and experience, and thus consist of both phylogenetic and ontogenetic material. When complexes in the conscious and subconscious find expression in thoughts and actions, the individual recognizes their source in his mind, and their influence on his mental activity. When, however, complexes are permanently repressed from the conscious and subconscious into the unconscious, he is unaware of their existence. Such complexes frequently strive to gain access to consciousness, but, owing to the repressive process, they can only enter and influence the stream of consciousness in forms so disguised and distorted that they are not recognized by the individual as having any connection with the forgotten complexes, the conscious being outwitted, as it were, by the unconscious. The circuitous and outflanking tactics of the repressed complex seem to consist in a process of sending out feelers for emotionally toned elements or systems of elements in the conscious, which will act as stimuli to one or other of the associated elements of the complex, and so enable the latter as a whole, but in disguised form, to find expression in the conscious. The manifestations or symptoms indicative of the existence of a repressed complex serve both to intensify the repressive process, and to conceal from the individual their real origin in the complex, thus ensuring its permanent repression. Symbolic forms of thought and action attributable to the presence of repressed complexes in normal people simply differ in degree from the more distorted forms (e.g., delusions and obsessions) arising from such complexes in the insane.

The new psychology thus regards the unconscious as forming the greater part of the mind, and as largely determining and activating the conscious and motivating conduct. It is a common failing with the protagonists of new and fashionable doctrines to overstate their case, and this is well illustrated in the present tendency to exaggerate the influence of the unconscious in human mentality and conduct, and to minimize the paramount importance of the conscious and its 'higher' characters in man, the very acquisition of which in the process of evolution has made it

possible for him to become the lord of the animal kingdom and the master of the world. It is obvious that if the unconscious played the predominant rôle, and had the final say, in the motivation of conduct, man would be nothing more than the creature and plaything of his instincts, an irresponsible and uncontrollable automaton. At the same time the facts and teachings of biology, neurology, and psychology plainly indicate the importance of the unconscious in human mentation, and the necessity for its investigation as a means towards a clearer understanding of the workings of the mind in health and disease. Thoughts, feelings, and the other phenomena of consciousness, the psychic symbols by means of which the individual expresses himself at the conscious level, must be traced further back towards their origins in order that their meanings may be better understood.

Psycho-analysis.—The exploration of the unconscious, for the purpose of revealing its complexes and other contents and processes, is primarily a method of clinical examination and diagnosis, and secondarily a mode of treatment; and in the latter respect it is, in psychiatrical practice, of much more limited scope than other methods of psychotherapy, such as the fundamental gaining of the patient's confidence by sympathetic understanding and handling of his difficulties and malady, rational explanation of symptoms and re-education, suggestion, persuasion, encouragement, and advice. Even experienced psycho-analysts admit that the treatment of an individual case requires a great deal of time, the sittings occupying an hour every day or every other day, and lasting for months or even years; and, further, that the treatment is applicable only in intelligent, accessible, and co-operating individuals, the subjects of the neuroses and psychoneuroses, and the milder and recurrent forms of the psychoses of the mania-melancholia group. The technique is difficult and requires much practice. (*See* PSYCHONEUROSES.)

CAUSATION AND PROPHYLAXIS.

To be able to cure, abort, or prevent an attack of mental disease, the practitioner must not only keep in view the neurological and psychological processes subserving normal and abnormal mentation, but also remember that the causation of the attack comprises at least two factors, namely, nervous constitution (predisposing) and trauma (exciting), of which the former is always resolvable into its physiogenic and psychogenic components, whereas the latter—and there is frequently more than one trauma—may be either physiogenic, as in the majority of cases, or psychogenic, as in the case of mental illnesses precipitated by emotional stresses.

A.—**Nervous Constitution.**—No one has a mental breakdown without previously being or becoming nervous. It does not follow that every nervous individual will have a mental illness. As a matter of fact, the nervous form a small—though it is to be feared, in this age of striving and unrest, an increasing—minority of the community, and only a small proportion of the nervous break down mentally, under the influence of one or more of the traumata to be referred to later. A nervous constitution being a precursor of, and a *sine qua non* for, a mental attack—and its presence can be demonstrated in every case if sufficient care be taken to ascertain the facts—it is important that those who have an unstable nervous system should recognize it as such, their weak point of defence and resistance, and regulate their lives accordingly; and it is the duty of the family doctor, as a prophylactic measure, to be on the look-out among his patients for those who have a nervous constitution, and to give timely and appropriate advice as to the mode of life, and the ways of dealing with the problems of environment and reality, including such important matters as the method of education, choice of occupation, and the like. What, then, are the sources of evidence which would indicate that an individual has a nervous constitution? Indisputable indications of an unstable nervous system are: (1) The presence of some actual congenital nervous or mental defect; (2) The presence of some acquired neurosis, psychoneurosis, or psychosis, or the occurrence of such during former life, from infancy and childhood onwards; (3) Present or previous addiction to, and persistence in, faulty habits and excesses; and (4) The presence of an abnormal or atypical disposition, the most frequent, as also the most subtle, sign of a nervous constitution.

Abnormal Disposition or Temperament may show itself in many forms. It is seen not only in those who are ordinarily, in the popular sense, regarded as nervous, excitable, highly strung, peculiar, or eccentric, but also in individuals who, for example, are *unduly and characteristically* irritable, bad-tempered, passionate, impulsive, sensitive, impressionable, emotional, apprehensive, suspicious, jealous, proud, vain, moody, optimistic, pessimistic, doubting, facile, obstinate, wayward, reserved, unreserved, social, asocial, forward, shy, altruistic, selfish, amorous, frigid, sympathetic, cruel, precocious, dull, or untruthful; and to these, which are some of the more common anomalies of disposition, may be added an undue susceptibility to the attraction and action of alcohol, for nervous

people frequently have a special proclivity to stimulants, and carry their liquor bad
Explained in the light of physiology and psychology, such anomalies of disposition m
that the individual concerned is possessed of a brain which reacts abnormally to t
ordinary conditions of environment, which parts too easily with its stores of energy, a
draws too readily on its reserves, a brain, therefore, which is prone to succumb to a
special strain or trauma.

The remaining sources of evidence of the possession by an individual of a nerv
constitution are derived from his physiognomy and physique, and from the record of
family health, and as these indications are more or less inferential and presumptive
nature, they require to be accepted with more caution.

The Presence of a Nervous or Degenerate Physiognomy and Physique.—It is infer
that, owing to the frequency of the so-called physical signs of degeneracy and neuro
among the mentally deficient and unsound, an individual presenting some of th
outward appearances is likely to have some intrinsic defect or fault of his nerv
organization. The validity of this inference is to some extent impaired by the fact t
the association of internal fault with external mark is often wanting, and further, t
the above physical anomalies are not uncommon amongst extremely capable persons.

*The Occurrence of Nervous and Mental Diseases among the Individual's nearer Bl
Relations.*—As regards acquired mental disease, there is a tendency at present to ex
gerate the influence of heredity, and to make of an insane heredity a veritable bog
branding the family as a whole. This view is not justified by the facts. To state t
position warranted by the facts, and, for simplicity, in terms of our individual un
consideration, it may be said that, if *he* has none of the *personal* indications of a nerv
constitution already referred to, there is no reason to fear that he will ever have
nervous or mental breakdown, even although one or more members of the family ha
so suffered ; and that even if, with such a family history, he has some of the perso
indications of a nervous constitution, for example, abnormal disposition, inherited
acquired, by taking care to regulate, and, if necessary, to reform, his mode of life
healthy lines, and to face and deal with his difficulties in normal ways, he will not ha
a breakdown, unless one or other of the traumata or stresses mentioned later proves t
powerful for his nervous resistance.

B.—**Traumata.**—The doctor may find it useful to refer to the following tabulati
of the more common traumata, or exciting factors, of mental disorder. Acting sin
or in combination, they have co-operated with the predisposing factor of nervous co
stitution in bringing about the present condition of the patient. It may sometimes
difficult to say whether some of the traumata present are operating as exciting
causal factors, or merely as concomitants and complications. In either case, they c
for treatment ; and the nature of the remedies to be employed is indicated by the natu
of the trauma, any disease or morbid condition present being treated on the lines
general medicine.

1. *Direct Pathologic Traumata* (organic diseases of the nervous system).

2. *Indirect Pathologic Traumata* (other bodily diseases) act as causes or as concom
tants, and produce malnutrition, poisoning, or exhaustion of the nervous system,
impair the sources of its energy within the organism.

3. *Toxic Traumata.*—External poisons producing intoxication of the nerv
system, e.g. alcohol, drugs, tobacco, lead, etc.

4. *Energic Traumata.*—External agencies producing shock and exhaustion of t
nervous system, e.g. head injuries, surgical operations, sunstroke, and electric shock.

5. *Psychic Traumata.*—Excessive mental perturbations or privations : (*a*) Pe
turbations, producing shock and exhaustion of nervous system :—(i) Sudden, e.g. 'shock
fright, grief, joy, etc. ; (ii) Prolonged, e.g. worry, anxiety, affliction, etc. (*b*) Privation
producing insufficient stimulation of nervous system, e.g. solitude, want of occupatio
deprivation of sight or hearing, etc.

6. *Hygienic Traumata.*—Privations or excesses in mode of life and exercise
functions, producing malnutrition, exhaustion, or poisoning of nervous system.

7. *Biologic Traumata.*—Abnormal changes occurring in the organism during t
mental epochs and reproductive crises of life in both sexes, and during the various phas
of child-bearing in the female ; probably of the nature of derangements, at the lowest

vegetative level of the nervous system, of tissue nutrition, internal secretions, etc., and producing malnutrition, poisoning, and exhaustion of the nervous system.

PREMONITORY AND EARLY SYMPTOMS, AND THEIR TREATMENT.

Some cases arise suddenly and with few premonitory symptoms, but the majority have some prodromata, which it is of the first importance for the family doctor to recognize and treat, especially in nervous subjects. It is here that the general practitioner's knowledge and skill come in rather than those of the specialist, who is commonly not called till the disease has established itself. It is certain that if the right treatment be adopted in this early stage, many cases need not become technically 'insane' at all; the disease may be cut short, and the prodromata may disappear.

Prodromata of Mental Disease.—Sometimes pronounced, but usually mild, these premonitory symptoms are bodily as well as mental in character, and they consist chiefly of the following :—

1. *Impairment of General Health*, indicated by feeling of want of tone, general debility, reduction of physical condition, loss in weight, anæmia, palpitation, feelings of faintness or dizziness, anorexia, indigestion, constipation, albuminuria, amenorrhœa, and loss of sleep. Impairment of general health commonly precedes a mental attack, either as exciting cause or early symptom.

2. *Sleeplessness*, varying from short, broken, unrefreshing sleep, and semi-conscious sleep, to marked insomnia, and sometimes accompanied by such features as unusual dreaming and nightmare. Insomnia is a very common symptom, and in nervous subjects may itself be sufficient to precipitate a mental attack; and, even in stable individuals, prolonged insomnia may produce brain exhaustion, and a condition verging on mild mental confusion.

3. *Nervous Symptoms*, pointing to exhaustion, toxæmia, and malnutrition of the nervous system, and largely neurasthenic and psychasthenic in type, e.g. feeling of general lassitude and tendency to rapid fatigue, loss of energy and power of doing work, inability to fix the attention or to concentrate; also, frequently, other nervous symptoms : (*a*) Sensory, e.g. headache, neuralgic pains, and other abnormal sensations in the head and body, and occasionally sensory misinterpretations in the form of transient illusions and hallucinations recognized as such. (*b*) Motor, e.g. fine intention tremors, local twitchings of muscles, and diminished motor power; also alterations of speech and writing; and changes in expression of face and eye, produced by the action of the facial or 'mind' muscles, e.g. features immobile, brow furrowed, eye dull and listless, or fixed and abstracted. (*c*) Reflex, e.g. increased knee-jerks, and occasional clonus. (*d*) Vegetative, e.g. quick, irregular, or weak action of the heart, loss of tone of the capillary circulation, altered blood-pressure, attacks of flushing and perspiration, or dry skin, nervous dyspepsia, and other neuroses of the viscera. (*e*) Tonic and trophic, e.g. loss of tone of the tissues, muscular flabiness, and failure of assimilation and ultimate nutrition.

4. *Mental Symptoms*, consisting in changes of disposition, character, and habits, e.g., increased nervousness, accentuations of usual traits of temperament, emotionalism, irritability, temper, depression or elation, pessimism or optimism, excitement, restlessness, sensitiveness, indifference, lethargy, antipathies, suspicions, fears, anxieties, doubts, indecision, stubbornness, mental automatisms, and mental actions independent of volition, and hysterical attacks.

Treatment of Early Symptoms.—Such symptoms of disordered working of an individual's mentation, and of its underlying physical mechanisms in his brain cortex, nervous system, and organism generally, varying in every individual case, and attributable in each to both physiogenic and psychogenic factors distinctive for the individual, indicate that the treatment of a case of mental disease in its early stage—as also in its later stages, should it become established—(1) Must be essentially individualistic, more so than in the case of other diseases; (2) Must include both physiotherapeutic and psychotherapeutic measures, whilst even the application of the various physical and chemical remedies which are required for the restoration of bodily and nervous functions involves the influence of suggestion and other psychical factors, which are fundamental in any form of successful treatment; and (3) Must frequently be empirical, and altered from time to time, as determined by the varying, and sometimes unexpected, reactions which are characteristic of the abnormally working brain. The treatment, therefore is necessarily different in different cases, but it mostly comes under the following headings :—

1. *Remove the causal and pathogenic factors* as far as possible, both those producing exhaustion poisoning, and malnutrition of the nervous system, and also those operating psychically, especially worry and anxiety, any possible source of which should clearly be eliminated.

2. *Restore the general health and nutrition*, and the functions of any bodily organ that may not be working normally.

3. *Try a change of environment and mode of life* for the time being, so as to give the

patient the beneficial effects of: (*a*) New surroundings; (*b*) Different air; (*c*) More rest, if exhaustion be a factor, as is usually the case; or otherwise, (*d*) More exercise, with special caution to avoid undue fatigue; (*e*) Change of occupation, (*f*) of recreation, and (*g*) of society, all of which must be restful and congenial to the patient, otherwise they bore and irritate; and (*h*) Change of diet, which should be tempting, abundant, and easily digestible, and, if there has been much loss in weight, supplemented between meals with one of the well-known invalid foods, several of them being tried in succession, if necessary, until the desired increase in weight is attained.

The above programme may be carried out in various ways, one of the most suitable being for the patient to pay a quiet visit to congenial relatives or friends in the country, among the hills, or at the seaside, provided that such kind people are available and willing to co-operate in carrying out the details of treatment. The patient should live as much as possible in the open air, even during the preliminary one or two weeks of rest treatment which is frequently required, arrangements being made for him to occupy during the daytime a bed or couch placed in an open shelter or summer-house, facing the south if possible, and suitably shaded and ventilated when necessary. Open-air rest, or the combination of rest and fresh air, is much more efficacious than indoor rest, and is specially useful for the improvement of such bodily symptoms and conditions as loss of sleep, loss of appetite and weight, dyspepsia, anæmia, and tubercle; it is also specially conducive to the amelioration of the more active nervous and mental symptoms, owing both to the reduction of muscular and nervous activity imposed by the regimen of rest, and to the soothing influence on the sensorium of the pleasant impressions and environment of the open-air life. If open-air rest is not practicable, indoor rest is the next best, and indeed the only alternative, when a preliminary course of rest in bed is necessary, and it is undoubtedly useful in many early mental cases, though slower and less effectual in action. It has also certain disadvantages and risks, which must be obviated. The patient is apt to be more isolated, and so, owing to want of sufficient distractions and companionship, to become more self-centred, and worse mentally, especially in cases of melancholia. Again, if indoor rest is protracted unduly, it leads to the evils of prolonged bodily inactivity, such as sluggish action of the skin, bowels, liver, and kidneys, defective metabolism and flaccidity of the muscles, and weakening of the heart and circulation—evils which are intensified by the regimen of over-feeding which is commonly, but mistakenly, enjoined during the preliminary indoor-rest treatment. These drawbacks, which do not occur in the open-air rest treatment of early cases, may be obviated by such measures as massage, passive and active movements, hydrotherapy, and electrotherapy. After the rest treatment is over, the patient should gradually resume outdoor exercise, lead a quiet open-air life, and sooner or later pursue some more active and congenial recreation, such as fishing, golf, tennis, etc. In cases in which the preliminary rest in bed does not seem to suit the patient, or in those in which it is not necessary, as in the absence of any indications of exhaustion, the more active outdoor life will be likely to prove a more effectual measure. Quick and exciting travel should be avoided, as being both exhausting and irritating. Sea voyages, long or short, are always attended with danger of easy suicide; are, indeed, often suggestive of such a catastrophe. Many are the patients who have been sent on a sea trip and who never returned. The recommendation of a sea voyage should never be made without the most careful consideration of the risks involved.

4. *Medicinal remedies* should likewise be employed, both as an aid to Nature's methods and efforts towards a cure, and as a help to the patient's own recuperative powers and processes. The medicines prescribed will, of course, be determined by the requirements in each case, but they commonly include such agents as the following:—

a. Aids to nutrition and digestion, e.g. cod-liver oil, although good cream, if obtainable, is more palatable, and, according to some authorities, more effectual; and extract of malt, which is specially useful in cases of debility with weak digestion, and combined with cod-liver oil, it makes a still more useful, and palatable, preparation; also bitter and acid tonics, e.g. quinine and nitrohydrochloric acid. A preliminary alkaline course of bismuth and soda with cinnamon, with or without rhubarb, may be necessary if gastric catarrh is present. In certain cases with marked exhaustion, feeble digestion, and poor circulation, alcohol is distinctly useful as a dietetic stimulant; but its use must be con-

tinued only for such time as is necessary to secure the objects for which it is prescribed ; and it should be stopped at once if the patient begins to like the drug too well. Except in such cases, alcohol should not be prescribed for mental invalids, who as a class are better without it, and should avoid its use, owing to their special tendency to acquire the intemperate habit.

b. Aids to circulation and blood-formation, such as cardiac tonics, e.g. digitalis, strophanthus, caffeine, and strychnine ; cardiac stimulants, e.g. alcohol, ether, and turpentine ; and hæmatinics, e.g. iron.

c. Aids to metabolism, internal antisepsis and excretion, such as potassium iodide, mercury, arsenic, quinine, acetylsalicylic acid (aspirin), hexamine (which is useful in *Bacillus coli* and other infections of the nervous system, as well as of the body generally), salvarsan and allied drugs (in syphilis and parasyphilis ; though indispensable in the treatment of syphilis, their use in early general paralysis has so far been disappointing), sera, and vaccines ; intestinal antiseptics, e.g. calomel, salol, β-naphthol, and bismuth salicylate ; purgatives, diuretics, and diaphoretics.

d. Nervine tonics and stimulants, e.g. nux vomica, or strychnine, which is the most powerful, and is only applicable in the early stages in mild melancholia, and must not be pushed unduly, as it is too stimulating in some cases ; also quinine, phosphorus, arsenic, caffeine, and ammonium carbonate.

e. Hypnotics and nerve sedatives, e.g. paraldehyde, barbitone or veronal, sodium-veronal, sulphonal, methyl-sulphonal, amylene hydrate, chloral hydrate, bromides, and opium. These should only be given if necessary, namely, for persistent insomnia or excessive restlessness and excitement, and in small experimental doses, singly or in various combinations, until it is ascertained which drug, or combination of them, best suits the patient at the time. None of them should be continued too long, owing both to the factor of toleration, and to the special risk of drug habit. In many cases a warm bath, or hot drink, or both, at bedtime, with the addition of a hot bottle to the feet, if necessary, secures a good night's rest and sleep. In sudden emergencies of intense mental excitement, which may occasionally arise, it may be necessary to give a hypodermic injection of morphine ($\frac{1}{4}$ gr.), or hyoscyamine ($\frac{1}{200}$ gr.), or hyoscine (scopolamine $\frac{1}{200}$ gr.), or of the combination of morphine ($\frac{1}{4}$ gr.) and scopolamine ($\frac{1}{200}$ gr.), as in obstetric practice for the production of the 'twilight sleep' during parturition. The same doses may be given of the salts of these alkaloids, e.g. morphine sulphate ($\frac{1}{4}$ gr.), and scopolamine hydrobromide ($\frac{1}{200}$ gr.).

5. *Psychotherapy*—based on the doctor's knowledge of his patient, of his bodily and mental constitution, and of his mode of reaction, not only to the factors which have brought on the disease, but also to the disease itself, and to his other present difficulties—will have been utilized from the first by the physician in his sympathetic understanding and appropriate treatment of the sufferer, and will thereby have gone far to secure the *sine qua non* for successful treatment in any form of illness, and especially mental illness, namely, the gaining of the confidence of the patient in his doctor's ability to help him. With this relationship established, or to establish it if necessary, the doctor will naturally employ any form of psychotherapy, based of course on the facts of the case, which he thinks will be helpful to the patient, such as rational explanation of the symptoms present, re-education, suggestion, persuasion, encouragement, and advice. Most people when ill wish to get well, and in many bodily illnesses any physician knows that much depends on the fight which the patient makes for recovery. Many mental patients, on the contrary, have lost their self-confidence, make little or no effort to get better, or even do not wish to get better. The physician must therefore untangle difficulties, explain to the patient the nature of his condition and symptoms, and his attitude towards them and towards recovery, induce him to make an effort, and to 'take up arms' against his troubles, and instil the forces of courage and of hope. Such psychotherapeutic weapons, along with the fundamental physiotherapeutic agencies already mentioned, will meet the requirements in the great majority of cases of early mental disorder. Whether dream-interpretation, free association, word association, hypnosis, or crystal-gazing—the weapons of the psycho-analyst—should be applied either for the treatment or the investigation of mental disease in its early stage is therefore doubtful. The length of time required for psycho-analytic treatment would alone

indicate that it should be reserved for a later stage. Its application should be restricted to the treatment of those psychoses in which it has been found useful, namely, recurrent cases of the mania-melancholia group, and those developing from the psychoneuroses and neuroses. And further, should psycho-analytic treatment be recommended in such a case, it should be undertaken only by a competent expert.

ESTABLISHED MENTAL DISEASE, AND ITS TREATMENT.

Environment and Surroundings.—If the preventive treatment of early symptoms has failed, and mental disturbance of a more decided kind has shown itself, the medical man is at once faced by many responsible questions. One of the first of these is the following :—

Is the treatment to be conducted at home, in rooms, or in a mental hospital? The patient's relations, he himself if sufficiently sensible, and the family doctor, all naturally desire home treatment if this is possible. As a matter of fact, it has been the experience of all who have had most to do with mental cases that home is on the whole the worst place for treatment ; but there are exceptions. A man's, and especially a woman's, home, is so naturally the place for the treatment and care of sickness and weakness, that it must not be left without sufficient reasons. Some persons, too, are such home birds, that being turned out of it is an especial hardship and irritation. In all that is about to be said it is assumed that the home is good, and that there are means to provide good nursing and all other requirements. There are many cases of short toxic delirium, of mania transitoria, of epileptic excitement, of puerperal insanity, of very slight melancholia, and, above all, of insanity of the aged, where home treatment can be effectually carried out if good nursing, companionship, and attendance can be secured. Especially is this the case if the home happens to be in the country or in the open suburbs of a city.

If it is decided that home is not the best place for care and cure, then, if the patient has sufficient means, or if he has kind relatives in the country who want to do him a service, a suburban house, or rooms in such a house, or a country residence, form the next alternative in certain cases. The private house of a doctor, a clergyman, or any other person of intelligence, is often a suitable temporary hospital in a mental case. In Scotland we have the enormous advantage of being able legally to treat an early case of mental disease away from his home, 'for profit' and without certification, for six months. Though the profession in England strongly desires such a measure for that country, several Bills introduced for the purpose, notwithstanding influential support, have not been passed by Parliament. The house we are to use should, if possible, have an enclosed garden, with a shelter or summer-house for open-air-rest treatment. Rooms on the ground floor should nearly always be selected for use if the case is acute or suicidal. All door-keys should be taken away and kept by the nurse. Inside bolts to the w.c.'s and bath-rooms should be taken off. The windows should be temporarily stopped so that the lower sash cannot be raised more than five inches. These precautions do not, however, apply to all cases. A sunny and cheerful outlook is a distinct adjunct to treatment. The medical visits should be frequent and thorough. They make the patient feel he is under treatment and not merely in isolation. Every precaution against suicide and accident should be carefully taken and stringently enforced. The patient should never have his medicines or administer them himself. In many cases the day should be systematically divided up as a therapeutic measure. Though the nearest relative is legally responsible, yet the doctor and nurse must be invested with plenary powers. The treatment of almost every kind of mental disease, from acute mania down to the mildest melancholia, can be carried out, in such circumstances, with reasonable success in many cases. It is largely a question of the doctor, the house, and the nurse. The expense is necessarily great, and risks cannot be entirely eliminated. The forms of mental disorder that are on the whole most suitable to treat in this way are melancholia where the suicidal impulse is not very intense, adolescent insanity of the milder types, recent puerperal insanity, hysterical insanity, mental disease associated with neurasthenia, mild and fairly manageable cases of mania, lactational insanity, that of pregnancy, senile insanity, and some cases of alcoholism. Poverty or limited means seldom admit of home or private treatment, but it is surprising how often it is possible to get even poor people with mild mental symptoms sent off for a change to some country relation, with admirable curative effects.

If the case is unsuitable and the means are inadequate, or if treatment at home or in rooms has failed, then comes the question of a good mental hospital. The chief considerations which determine such a decision are a continuation of acute symptoms, a marked aggravation of the disease, intense persistence in and subtly schemed suicidal attempts, great violence, homicidal impulses, very dirty habits, much noise, offensiveness to decency, quarrelling with a succession of nurses, and manifest failure of other methods of treatment. These undoubtedly point to institution treatment, where there will be abundant nursing, a medical régime of orderly living, discipline, suitable rooms, secluded gardens, open-air shelters and verandahs, and instant medical attendance. Many patients will obey the rules of an institution quietly who will not submit to personal orders. Good institutions, too, have suitable occupations, amusements, and means of passing the time which cannot be got in private treatment. They have villas, means of classification, hospital wards, and seaside houses. Scarcely any case that seems curable should ever be allowed to drift into incurability without such a hospital being tried. The mental and therapeutic effect of hospital treatment is sometimes immediate and indubitable.

In this connection it is strongly urged that in all our large general hospitals, especially those of the medical schools, there should now be instituted wards with open-air verandahs suitably administered and specially adapted for the treatment of our poor suffering from early and transient mental symptoms. Especially since the treatment of so many recent cases of insanity by rest in bed in the fresh air and accompanying remedial measures has been found efficient, the provision of such wards in our general hospitals is called for.

If a mental hospital is decided on, certain legal formalities are required, which are referred to later, and all necessary arrangements must be made with the physician in charge of the institution, who will give advice as to the patient's removal, if any difficulty arises in the matter. Avoid deceiving the patient. Say he is going to be under a doctor's care. The principle holds good that a man whose mind is affected has a moral right to truthful statements. But there are many exceptions to this axiom, where truth may clearly aggravate the symptoms of the patient's disease. Then it comes to be a medical question whether euphemisms and a certain modification of brutal candour may not be reckoned among the medicines the patient has to swallow for his good.

Nursing.—The securing of a good and experienced nurse, male or female, is one of the most important early considerations. Nowadays experienced and certificated nurses of both sexes, trained under the Medico-Psychological Association rules, can be got from most nursing homes. A 'mental nurse' has many advantages over one with no such special experience. The orders to the nurse must be specific, and in detail. She should keep a regular record on the clinical chart, and in her notes, of all matters pertaining to the patient's condition and symptoms, mental and bodily. Provision should be made also for her going off duty, as no kind of nursing is more exhausting than the nursing of a bad mental case. If means allow, the nursing strength ought to be over what would be necessary in a case of ordinary bodily disease.

Feeding.—The next thing that has to be provided for is the feeding of the patient. A good cook is often of as much importance as a good doctor. Food should always be tempting, nourishing, well cooked, well served, and abundant. For most acute cases some of the food at least should be fluid or nearly so. Nothing is so good, so handy, or so easily obtained as milk or liquid custard, made of a pint of milk just under the boiling point, into which one egg, or occasionally two eggs, after being beaten, are stirred, with sugar. Such a custard is dietetically a meal. Several such custards a day constitute a nutritive diet that is easily digested. The doctor should always be provided, in case it is required, with a long rubber nasal tube, No. 10, 12, or 14 catheter size, with a funnel attached, which can be passed through one nostril, and in this way the patient may be fed if food is entirely refused ; this can now be obtained from all surgical-instrument makers. If the feeding has to be long continued, the custards can be supplemented by strong soups, mutton ground in a mortar, vegetable juices, jellies, fruit-juices, and sugar in solution. The condition of the stomach and of the digestion must, of course, be the test of how much food is to be given, and in some acute cases peptonized milk is necessary. In most acute cases, food should be given liberally, but not to the extent of over-feeding. Nourish your patient well, and make him gain in weight, are rules to which there are few exceptions in mental medicine. Frequent feeding and night feeding are often required. In many

cases a tumbler of hot milk at bedtime, with the addition of 1 or 2 oz. of whisky in debilitated states, will be found to be the best soporific the patient can have.

Indoor Rest, Open-air Rest, and Exercise.—In all acute or recent attacks of established mental disease, a preliminary course of rest in bed is advisable, to counteract the underlying process of nervous exhaustion, with its accompanying dissolution of the neurones of the cerebral cortex. It should be carried out, if possible, in the fresh air, in the manner described under the 'Treatment of Early Symptoms', otherwise indoors. The advantages of open-air rest as compared with indoor rest, already referred to, are still more manifest in the case of established mental disease, in which more prolonged treatment is necessary. Open-air rest in such cases may be continued for weeks or even months when required, without any of the disadvantages of indoor rest arising. Opportunity, however, should be taken from time to time in protracted cases to test whether the patient will respond better to the complementary régime of exercise, which is prescribed in every case, sooner or later, after the stage of rest has served its purpose.

Massage, Hydrotherapy, and Electrotherapy.—*Massage* is a poor substitute for exercise. It is not required in mental cases treated with open-air rest. But in cases treated with indoor rest, it is required to counteract the flaccid and sluggish conditions of the muscles, viscera, and metabolism, due to prolonged inactivity—conditions, however, which may arise in other ways. Massage is very beneficial in the treatment of such conditions; but apart from them it is of no special value as a remedy in mental diseases, its chief use being as an adjunct to some forms of hydrotherapy, e.g. wet packs and continuous baths, when such are employed.

Hydrotherapy in one form or another is distinctly useful in the treatment of mental diseases, not only promoting the excretory function of the skin, and so aiding the removal of toxic substances from the body, but also acting as an efficient stimulant or sedative to the nervous system, as also to the heart and circulation. It must therefore be employed with care in persons whose nervous system is much below par, and especially in those who are also the subjects of heart disease. If a healthy adult takes a very hot bath, as hot as he can get into (say, up to 105°), it at first acts as a stimulant, contracts the arteries of the skin, and raises the blood-pressure; and if he remains in the bath long enough, say, from fifteen to thirty minutes, it acts as a sedative, dilates the skin-vessels, and lowers blood-pressure. Radial pulse-tracings, taken immediately before the bath, and during it, after the expiry of, say, two minutes and thirty minutes, show such effects. If the healthy adult takes a short cold bath, say at 60°, lasting about two minutes, it acts as a stimulant, contracts the skin-vessels, and raises the blood-pressure; and the preliminary sensation of chill from contact with the water is followed almost immediately by a pleasant feeling of reaction, which is increased by the rub-down with the rough towel which follows. In persons whose nervous system is much below par, the shock of the chill from such a bath is too severe, the reaction is delayed or does not set in at all, and a feeling of lassitude follows. In other words, such cold baths, and likewise very hot baths, are unduly exhausting in such subjects. Warm baths, at or near normal body temperature, and within the limits of 95° and 100°, and cool baths, showers, or sprays, not sufficient to cause too great a chill, are more suitable for mental invalids, respectively soothing without fatiguing, or stimulating without exhausting, the central nervous system. When rest treatment, outdoor or indoor, fails to produce the desired effects in a sleepless and excited patient, as in some cases of mania, a warm bath for half an hour, accompanied, if necessary, with cold compresses or ice-bags to the head, and followed by a tumblerful of hot milk, containing, if necessary, a maximum dose of a suitable hypnotic or sedative, sometimes effects a long and refreshing sleep; and this procedure can be continued for weeks, with safety and benefit to the patient. The continuous warm bath, in which the patient lies in the water for several hours daily, is also useful in such cases. In some cases of melancholia, confusion, and stupor, in which progress is not being made after the acute stage, cool spray, shower, or plunge baths, or spinal douches, are occasionally beneficial in effecting the required stimulus towards recovery. Hot-air or Turkish baths, and hot-vapour baths, are sometimes useful in conditions of confusion and stupor. Wet packs, hot or cold, though frequently employed in the treatment of various bodily diseases, are seldom used in this country in psychiatrical practice. They are beneficial in excited and other cases; but like all other forms of hydrotherapy, they should not be employed if the

patient does not willingly submit to them, as otherwise their application will do more harm than good, by irritating and exhausting the patient. Baths and wet packs were much used in British asylums at the middle of the nineteenth century ; but their abuse led to their being placed under the official ban of 'restraint', with the result that the practice of hydrotherapy in mental hospitals gradually fell into disuse from the seventies onwards, though it has been continued in some forms by various physicians. Hydrotherapy has, during the past twenty years and more, greatly developed in German and American psychiatrical practice, especially in the forms of the wet pack and continuous warm bath, which constitute a main feature of treatment in the mental hospitals of those countries.

Electrotherapy is of little value in mental diseases, apart from its suggestive influence, in which connection it has been found useful in hysterical and neurasthenic cases, in the form of the faradic and static currents. Its chief applications are in the concomitants and complications of mental disease, e.g. faradism for the flaccid muscles and sluggish metabolism resulting from prolonged indoor rest ; faradism and galvanism for paralysis ; galvanic, static, and high-frequency currents for headache, neuralgia, and sciatica.

Occupational, Recreational, and Social Therapy.—In most cases of mental disease, provision must be made for the patient's mind being withdrawn from his own morbid ideas and feelings. He must be taken out of his morbid self. Selfishness and self-centredness are the characteristics of most forms of insanity ; therefore we must try to get the patient to do simple kinds of work, such as gardening, knitting, or sewing. We must also amuse him by suitable games, such as golf or fishing, or anything else that he takes an interest in. The social instincts are often morbidly lessened, and we must try to provide suitable company and pleasant social intercourse. In fact, for the treatment and cure of this disease the patient's whole life must be conditioned. This is never a simple matter, and implies constant thought on the part of the doctor and the nurse.

Medicinal Remedies.—In addition to what has been already said on this subject under early treatment, it is necessary to refer to some special points when the disease has become established. Thus, there are very few cases for which tonics of some sort are not beneficial at some stage, such as quinine and nitrohydrochloric acid, or quinine and iron in anæmic conditions, and in the later stages, after the active symptoms have subsided, strychnine or nux vomica, or the syrup of the phosphate of iron with quinine and strychnine.

Derangements of the functions of the stomach, intestine, and liver are frequent in mental disease. Constipation, with its accompanying putrefaction of the bowel contents, and resulting toxæmia, is very apt to occur, especially in melancholia, and must be obviated by the regular use of laxatives, and, when it occurs, relieved by means of purgatives, with the addition of intestinal antiseptics when indicated. Calomel is still one of the most useful drugs for this double purpose, given either in small alterative and antiseptic doses of $\frac{1}{4}$ gr. to 1 gr. twice a day, or in larger purgative doses of from 3 to 5 gr. at night, followed by the early morning saline draught of magnesium sulphate, 2 to 4 drachms. Saline laxatives, including the ordinary mineral aperient waters, are given as draughts in the early morning with excellent effect ; and among the other cathartics frequently used are the common laxatives, e.g. castor oil, cascara, liquid paraffin, rhubarb, and senna ; the hepatic stimulants, e.g. aloes, colocynth, iridin, and podophyllin ; and the cholagogue purgatives, e.g. euonymin, blue pill, and calomel.

The heart's action is often weakened in cases of mental disease, especially in prolonged mania and agitated melancholia, and in the toxic and infective psychoses. Fatty degeneration, and valvular disease, of the heart, and arteriosclerosis, are common, and accompanied by blood-pressure alterations. Alcoholic stimulants, in the form of wines, malt liquors, and spirits are distinctly indicated for patients with weak cardiac action, impaired digestion, physical debility, and mental exhaustion. Digitalis, strophanthus, and strychnine, along with tonics, are also beneficial in such cases. Potassium iodide in 5-gr. doses is often useful in some cases of melancholia with a specially quick pulse, and also in arteriosclerosis and high blood-pressure.

Organotherapy has been tried extensively in mental diseases, but, apart from thyroid extract, the results so far have been disappointing. Certain cases of mania and melancholia, after the acute stage is over, remain in a stationary condition of confusion or

stupor or mild depression. If such patients are given large doses of thyroid daily, namely, the equivalent of one sheep's gland (= 60 gr. daily in 'tabloid' form), and these doses are repeated daily for a week, the pulse being watched carefully, the patients lose on the average 7 lb. in weight, but during the ensuing month, or thereabouts, they gain on the average 21 lb., or 14 lb. more than their weight before taking the drug ; and in about 12 per cent of the cases the mental condition clears up and recovery occurs. Thyroid in such doses acts as a powerful katabolic stimulant, and a marked anabolic rebound sets in after the drug is stopped. The successful results have been relatively more frequent among women than among men, and notably in psychoses associated with child-bearing. These large doses of thyroid must be given with care ; they should not be given to patients below 20 or above 60 years of age, nor to stout or thin subjects, nor to those who are losing weight. Extracts of other glands and organs have been tried in many different varieties of mental disease, including those associated with the epochal crises of life, but so far without notable result.

Hynoptics and Sedatives.—All such drugs being in large doses brain-poisons and arresters of function, their use and selection is a matter for the utmost care in each case. In the small doses in which they are given to control wakefulness and restlessness, they diminish the morbid action that is going on in the brain-cells, whose nutrition and katabolism are thereby modified. Therefore care must be taken to observe whether the sleep and quiet produced is as nearly as possible a natural and beneficial sleep, and whether any function is being disordered, or the tendency to recovery being interfered with in any way. The objects aimed at through the use of hypnotics and sedatives are : (1) To cut short the disease in acute cases ; (2) To re-establish the sleep habit of the brain ; (3) To tide over short attacks ; (4) To take the edge off bad symptoms, so far as to let other measures have their effects ; (5) To save the exhaustion of insomnia and motor excitement ; (6) To combat temporarily dangerous symptoms ; (7) To quiet screaming and noise ; (8) To give needed sleep and rest to relatives and nurses ; (9) To give home or villa treatment a chance before a mental hospital is resorted to. Our most useful hypnotics and sedatives are included among the following official drugs :—

Paraldehyde (dose, 1 to 2 drachms, repeated if necessary, and may be gradually increased to 3 or 4 drachms ; its unpleasant taste may be covered to some extent by mixture with diluted syrup and other flavouring agents). It is one of our best, safest, and quickest hypnotics, does not depress the heart, and even stimulates it ; and it may be continued, if necessary, for long periods without any bad effects, although very occasionally a mild craving may arise, notwithstanding its taste, and also the odour which it imparts to the breath during the morning after its use. It may be combined with the bromides, which prolong its effect.

Amylene hydrate (dose, ½ to 1½ drachms, in peppermint water) is a quick and good hypnotic, but it is expensive.

Chloral hydrate (dose, 15 to 30 gr., in syrup and water) depresses the heart and respiration, and so should not be continued long, especially as it also causes a craving. It may be combined with the bromides with good effect.

Veronal or *barbitone* (dose, 5 gr., in hot milk or tea).

Veronal-sodium (dose, 5 to 10 gr.) is more soluble than veronal.

Methyl-sulphonal (dose, 15 gr., in hot milk or tea) is a good and rapid hypnotic.

Sulphonal (dose, 15 to 30 gr., in hot milk, taken two or three hours before its effect is desired). It is a hypnotic and sedative, its sedative effects often lasting one or two days after its administration. It is not soluble to any extent, and the delay in its action can be tided over by giving paraldehyde along with it. It is of most use in cases of insomnia combined with restlessness, noisy excitement, and general troublesomeness to manage ; and also in helping to cut short threatened relapses. It produces a refreshing sleep, but leaves giddiness and a feeling of confusion in the morning. It may be combined also with methyl-sulphonal, and with the bromides. Owing to its insolubility, it is apt to accumulate in the intestine ; and if its administration is unduly prolonged, it may cause a serious, and sometimes fatal, toxic condition, characterized by muscular weakness, inco-ordination of gait, slurring of speech, vomiting and diarrhœa, and in time a port-wine coloration of the urine, due to the presence of hæmatoporphyrin, derived from the red blood-cells. Methyl-sulphonal may cause the same condition—to

prevent which, both drugs, and such others as veronal, should always be administered in as soluble a state as possible, the bowels regulated by aperients to act daily, and the patient induced to drink plenty of fluids. Whenever a patient shows any of the initial toxic symptoms, he should be given equal parts of milk and lime-water; for if the condition reaches the stage of a port-wine urine, it is often fatal.

Opium (dose, ½ to 2 gr.; or given as *tincture of opium*, 15 to 30 min., in rectified spirit) acts more as a sedative than as a hypnotic, but owing to its tendencies to cause a craving and habit, to produce constipation, and to dry up the secretions, it has a restricted field of application in mental disease. Its chief use is in intractable cases of agitated melancholia, some of which are undoubtedly benefited thereby. It is also used in cases of melancholia and confusion with marked exhaustion, in which it quiets the irritability, and stimulates the nutrition, of the nerve centres.

The Bromides of potassium, sodium, and ammonium (dose, 30 gr. of any one of the three, or 10 gr. of each of the three combined, with 2 min. of liquor arsenicalis per dose when their use is prolonged, and given with plenty of water). The bromides lower the reflex irritability of the central nervous system, and act as mild hypnotics and sedatives in mental disease. They are suitable for mild cases of insomnia and excitement; but their chief use in mental disease is in combination with the other sedatives and hypnotics, so as to intensify, but especially to prolong, their effects, as the result of which several hours' longer sleep or brain rest is obtained, with smaller doses of the hypnotics and sedatives than would otherwise have been necessary. If prolonged in melancholia, they may increase the mental depression. In epileptic brain excitement they are an essential means of treatment, and in large doses. In epileptic psychoses, as in epilepsy, the mixture of the three bromides, given in two doses of 30 gr. after the morning and the evening meal, is a convenient way of ensuring their administration with plenty of water. Many physicians prefer the potassium salt to the other two.

VOLUNTARY AND CERTIFICATED PATIENTS IN MENTAL HOSPITALS. HINTS ON CERTIFICATION.

If it seems desirable or necessary that a patient with mental illness should go to a mental hospital for treatment, the practitioner should, in the first place, always consider the possibility and suitability of the patient going as a 'voluntary boarder' (England and Ireland) or 'voluntary patient' (Scotland), because, if he goes on that footing, he does not become a 'lunatic' or 'insane person' or 'person of unsound mind', in the statutory sense, but remains, technically, sane. This is obviously an enormous advantage; and further, if this more pleasant mode of admission to a mental hospital were considered more frequently than it is, many patients would put themselves under the specialized treatment and régime which any good mental hospital provides, sooner than they do, and therefore with a better prospect of recovery, and not allow themselves to drift until the odds begin to be distinctly against their recovery. According to the present provisions of the statutes in this connection, only private or paying—not union or parish—patients can enter mental hospitals as voluntaries, to use a shorter term. One of the first important reforms of our present statutes in these matters should be the legalizing of the admission as voluntaries of union or parish patients, who at present can only be admitted to mental hospitals as certified 'pauper lunatics'. No one can feel surprised that in their case the question of mental hospital treatment is put off as long as possible; and this must mean much permanent incurability that might have been avoided under a more enlightened and, obviously, a more economical, system. In England voluntary boarders can be admitted only into registered hospitals and private asylums, and can leave on giving one day's notice. In Scotland they can be admitted into any mental hospital which receives private patients, including district asylums, some of which, however, reserve their beds for pauper lunatics only. In Ireland there is no statutory provision for the admission of voluntary boarders into either private or district asylums, but the Inspectors (Commissioners) raise no objection to their residence in private asylums, on the following, among other conditions: (1) That the patient applies beforehand in his (or her) own handwriting to the Inspectors for permission to enter the institution; (2) That he receives their permission before entering it; and (3) That he understands that he enters it of his

own free will, and is at liberty to leave at any time he wishes, on giving reasonable notice; and the Inspectors' formal permission and reply to his application contains an instruction to that effect. These model conditions could not be improved upon. It will be noticed that there is no condition, such as obtains in England and Scotland, that the patient must be uncertifiable. Provided that he is willing to go, and knows that he can leave when he likes "on giving reasonable notice", it does not matter whether he is certifiable or otherwise. Surely if a person is ill mentally, and is recommended by his doctor and relatives to go for the special treatment which he requires, and which can only be obtained at a mental hospital, and further, is willing to go, he should be allowed to go, he should have the *moral right* to go, even though he be certifiable; for there are many certificated patients in mental hospitals—both private patients and, especially, pauper patients—who would have been willing to go for treatment of their own accord, had they been given the opportunity to do so. It will be noticed that in Ireland the intending voluntary must make his application to the Inspectors, and to them only, and must receive their permission, with its contained instructions, *before* he can enter a mental hospital. This procedure, with its implied protection of the public, is undoubtedly the best and most satisfactory arrangement. In Scotland also the intending voluntary must apply to, and obtain the sanction of, the Commissioners, but not necessarily before entering the hospital; for he may also apply to the Medical Superintendent, and be received as a voluntary for three days, before the expiry of which the necessary 'sanction' of the Commissioners must also be obtained (in response to an additional letter of application by the patient for the purpose). In England the intending voluntary must send his letter of application, accompanied by a medical report, to the Commissioners or Visiting Justices, before entering a private asylum; but in the case of a registered hospital he must apply to the committee of the hospital, and no other application is necessary.

In Ireland the voluntary may leave "on giving reasonable notice"; in Scotland on giving three days' notice, which is short enough to enable the relatives to make other arrangements; and in England on giving only one day's notice, which is absurdly short. One week's notice would be much more reasonable from the point of view of the relatives, who may have a one day's notice suddenly sprung upon them, owing to the whim or unexpected change of mind of a patient who, in such a case, would be likely to be one who would be the better for longer treatment, and might change his mind again, if given reasonable time for reconsideration. If a voluntary in a mental hospital becomes worse, and apparently a proper person to be detained for care and treatment, and he gives his notice to leave the hospital, he should leave it as he entered it, and be handed over to his relatives. If they think that his mental condition is such that detention is necessary, and they wish him to have further treatment at the hospital, they should take him to two outside doctors for an independent opinion; and if the latter are prepared to certify him, they should do so, as part of the procedure necessary for his return to hospital, as a certificated patient. Only in very exceptional circumstances, which make no alternative course possible, should a voluntary in a mental hospital be certified on the premises.

The practitioner, therefore, should realize that, just as mental disorder in the medical sense does not necessarily imply insanity in the legal sense, so also insanity in the legal sense does not necessarily imply detention for treatment; and that, just as there are many persons in the community who are mentally incapacitated in a medical and even in a legal sense, and yet have so much self-control left that they are not proper persons to be detained under treatment, so also such persons may give proof of their self-control by being willing to place themselves under treatment in a mental hospital when this seems desirable or necessary; and therefore they should be given the opportunity of doing so, out of fairness and justice to themselves.

Reference has already been made to the useful provision of the law in Scotland, which enables a mental patient, with a view to his recovery, to be treated away from home in a private house (that is, for profit), for a period not exceeding six months, under a medical certificate to the effect that the "malady is not confirmed". This provision would be still more useful if the maximum period were extended to twelve months. Apart, then, from this provision for treatment in a private house in Scotland, and the still incomplete provisions for the treatment of individuals from all classes of the community as voluntaries in mental hospitals in England, Scotland, and Ireland, the only alternative for treatment

of a mental patient under private or 'single care', or in a mental hospital, is by means of certification.

Certification of an individual not merely as "a person of unsound mind", but also as a "proper person to be taken charge of and detained under care and treatment" (the words "taken charge of and" occur in the English and Irish certificates, but not in the Scottish), is one of the most important, and perhaps the most responsible, of the medico-legal duties imposed upon a medical practitioner, for it is the first essential step in the process of depriving a mental patient of his full freedom as a fellow-citizen; and further, in the case of a British subject affected with mental disease, whereas the common law would deprive him of his liberty on the grounds only of danger to himself or the community, by the recognized practice throughout the country, the lunacy statutes go further, and clearly enact that "care and treatment" are the grounds and main objects of his detention, whether he be dangerous to himself, or to the community, or to neither. No doubt danger to himself, or to others, or to public property, or disturbance of the public peace, are, in many cases, the immediate factors which draw attention to the underlying disease, and the necessity of detention for purposes of treatment; but other facts constituting fitness for detention are inability to look after himself and his affairs with sufficient care, severity of the mental symptoms, and amenability to curative treatment which cannot be carried out without depriving him of his liberty for the purpose; due consideration, of course, being given, from all points of view, to the expediency of the step, and to any legal risk to the doctor or to the relations. The above considerations indicate that, in carrying out the responsible duty of certification necessary in certain cases of mental disorder, and entrusted to him under the lunacy statutes, the medical practitioner must act with the most scrupulous care, and with full recognition of the obligations to fidelity reposed in him.

If, then, you are called in to examine and give advice about a mental patient, before you see him, get as full a history of his case as you can, and the clue to any delusions and peculiarities of conduct that may be present. Obtain the information from the nearest relative, or an intimate friend, or the nurse. When introduced to him, never employ subterfuge or deceit. If he is sufficiently sensible, and wishes an explanation of your visit, say that you are a doctor, and have been asked to examine into his state of health. If he does not give you a lead, proceed to inquire about his bodily health, and examine him physically. This will probably lead to the desired opening. The greatest tact is often necessary to bring out the real condition of a patient's mind, especially if he is on his guard. Meantime, from the moment of your entering the room, keep on the outlook for any morbid manifestations of his mind; in other words, observe "*what he looks like, what he says, and what he does*". These are the ways in which the mind of the individual is expressed, and if the mind is disordered it will show its disability in the form of some morbid change in the patient's—

1. Appearance and general demeanour, including attitude and gait, movements and gestures, noises and cries, and expression of face and eye. Any morbid changes in the patient's appearance in these respects would, if present, be likely to strike the observer from the first, and, if sufficiently marked, would be "facts indicating insanity" for purposes of certification. Some of these changes may be clues to the presence of delusions, and of hallucinations, as of hearing and sight. Under this heading would be included if present, such items as peculiarities of the patient's apparel, in the appearance of his room, etc.

2. Conversation, including writing, letters, drawings, paintings, or any other observed product of his thought and feeling. Morbid changes here, if present, are more important 'facts', including as they do such items as delusions, hallucinations, confusion and incoherence of talk, and impairment of memory, recent and remote.

3. Conduct, including actions, impulses, habits, and behaviour generally. Morbid conduct is the most important evidence of certifiable insanity for purposes of detention, and, if present at the time of examination, may be observed in such forms as excessive excitement, restlessness, violence, shouting, peculiar mannerisms, destruction of clothing and other articles, deteriorated habits, noisy talking to himself, voracious eating, refusal of food, attempts to harm himself or others present, etc. Much of the evidence of insane conduct may not be observed by yourself at the time of examination, but may be communicated by others who have seen the patient.

If you have known the patient before, you will be able to compare him with his normal self, and to estimate more easily the significance of the changes you have observed. If not, your standard of comparison must be that which passes for normality amongst his class. You may have to visit him several times before you can make up your mind. But having formed your 'opinion' or 'conclusion', on the basis of your observed facts, first, that the patient is "a person of unsound mind", and secondly, that he is "a proper person to be taken charge of and detained under care and treatment", then advise the responsible relatives that certification is necessary, giving them your reasons, pointing out the risks, and indicating that the responsibility rests on them, not on the doctor. If the views of the relatives are divided upon the state of the patient's mind, discuss the matter with the opposition, with a view to arriving at a common agreement as to what seems best for the patient.

While the mode of placing a certified patient in a mental hospital (or in a private house) is different in England, Scotland, and Ireland, the statutory form of medical certificate is practically the same in the three countries. *In filling in the certificate keep in mind the following points :—*

1. A medical certificate of insanity has by law the force of a statement made upon oath.

2. Always refer to the marginal directions, as any omission, from the legal point of view, may invalidate the whole document.

3. The only 'opinion' or 'conclusion' which you embody in the certificate is that the patient is (1) "a person of unsound mind" (or allied term), and (2) "a proper person to be detained under care and treatment", this opinion or conclusion being based upon definite "facts observed" by yourself, and supplemented if necessary by "facts communicated" to yourself by others.

4. "*Facts indicating insanity observed by myself*" (Scotland—plus the words "*at the time of examination*" in the English and Irish forms, in which a marginal direction indicates that the certifier may subjoin in a separate paragraph any facts indicating insanity which were observed previous to the time of examination). *Facts observed* constitute the most important part of the certificate. They must be direct observations, not inferences from observations, or opinions, or hearsay. Thus, what is actually observed is that the patient *does* this or that, or *does not do* this or that, *says* this or that, *looks* this or that, etc. Do not make such statements as that he 'feels' this, or 'thinks' that, or 'cannot remember' this, or 'will not answer' that, all of which are inferences as to his feeling, knowing, willing, etc., derived from the actual observations, which are the only legitimate facts. Further, the facts stated as indicating insanity must be such strong evidence of insanity as not merely to satisfy your own mind, but to convince ordinary intelligent people that the patient is insane and a proper person to be detained for purposes of care and treatment ; and therefore, facts such as will bear cross-examination of yourself in a court of law. When the "fact indicating insanity does not carry insanity on the face of it", it should be supplemented by a statement that it is incorrect. Thus, if a delusion expressed by the patient is stated as one of the 'facts', and carries with it the possibility of a correct belief, you must satisfy yourself that the patient's expressed belief is erroneous, and after stating it as one of your 'facts', add such a statement as, "which is a delusion", or, "which is not the case", etc. Of observed facts indicating insanity and fitness for detention, those relating to conduct (e.g., outrageous actions, noisy behaviour, absolute insensibility to impressions, etc.) are usually more cogent than those relating to conversation (e.g., expressions of suicidal and homicidal intentions and inclinations, delusions, incoherent and confused talk, loss of memory—specific instances of any of which, when observed, should be given as nearly as possible in the patient's own words—or complete taciturnity). Those relating to the patient's appearance are usually the least cogent for purposes of certification, though changes from his normal appearance are often important and striking, especially if you have known him before. In some cases the various facts are not cogent individually, but in combination form the basis of a convincing certificate. Express the facts clearly and pithily, and arrange them in a natural sequence. Keep the sentences short, and do without qualifying clauses. Avoid ambiguity in the use of personal pronouns. Do not make indefinite and irrelevant statements which do not clearly indicate insanity. Never insert statements which go to prove sanity, and always exclude any reference to physical symptoms.

5. "*Other facts (if any) indicating insanity communicated to me by others*" (Scotland—the Irish form omits the words "to me"; the English form reads simply, "Facts communicated by others"). *Facts communicated* are not necessary if the facts observed by yourself are strong. They are usually included, and they strengthen the certificate. They are necessary if your own facts are weak. They include information as to such previous happenings as homicidal and suicidal attempts or threats, and other manifestations of insane conduct, conversation, and mentation generally. State this information clearly, and in such a way as to leave no doubt as to the persons to whom the pronouns refer; and give if possible the full name, address, and occupation of each informant.

6. Fill in your signature and address, and the date.

7. After completing the certificate, run it over carefully, in order to correct any possible omissions, redundancies, or grammatical errors. *C. C. Easterbrook.*

MERALGIA PARÆSTHETICA (Bernhardt's Disease).—(*See* NERVES, PERIPHERAL, AFFECTIONS OF.)

METATARSALGIA (Morton's Disease).—This is the name given to a painful condition of the forepart of the foot associated with flattening of the transverse arch of the foot formed by the heads of the metatarsal bones. The disease is characterized by cramp-like pain on standing or walking, usually centred around one particular metatarsophalangeal articulation, most commonly the fourth. Later, the pain may spread all over the foot and up the leg. Removal of the boot almost invariably relieves the pain. Adults over 30 years of age are affected, and females more commonly than males. The foot may appear otherwise normal, but a drop of the longitudinal arch is extremely common, though occasionally the arch is increased and sometimes the calf muscles are short. A callosity or corn beneath the depressed metatarsal bones is commonly present. The painful joint is usually tender on pressure.

TREATMENT.—A well-fitting boot with sufficient room for the toes and ball of the foot is essential. A bar of leather placed in or on the sole of the boot opposite the necks of the metatarsal bones may take the weight off the tender joint and so relieve the pain. A piece of strapping bound round the foot just behind the metatarsal heads, thus restoring the arch, may stop the pain, but obviously this cannot be used permanently.

The most satisfactory way of dealing with this condition is by the use of a sole-plate. The plaster model to which the plate is fitted is carved away opposite the necks of the three centre metatarsal bones, particularly that which is the seat of the pain, while due allowance is made for the support of the flat foot. Only in quite exceptional cases is removal of the head of the affected metatarsal bone necessary. This operation is usually successful. *H. A. T. Fairbank.*

METEORISM.—(*See* FLATULENCE.)

METRORRHAGIA.—(*See* MENORRHAGIA.)

MIGRAINE.—A term often applied to any severe attack of headache occurring periodically. In its more limited use, however, it is applied to a group of symptoms characterized by headache, general or local, peculiar visual phenomena, generally with the loss of central vision and scintillations round the periphery, and vomiting. Vomiting may relieve the headache, but the patient often remains in a prostrate condition for several hours. The visual phenomena may be present without other symptoms. The symptoms occur usually in persons of a nervous temperament, whose occupation is sedentary and requires concentrated visual and other attention. It is not infrequently hereditary.

TREATMENT.—This may be dealt with under two heads: (1) *The Acute Attack;* (2) *Between the Attacks.*

1. **Treatment of the Acute Attack.**—The patient will often awake in the morning knowing that he is about to have an attack of migraine; in such circumstances, a brisk effervescing saline purgative will sometimes inhibit it.

During the attack the patient should be kept in bed in a slightly darkened room, 1 or 2 gr. of calomel, or blue pill, should be administered, and the patient given hot water

to drink. For the relief of headache, local remedies may be tried by the application of heat or cold to the head, a mustard plaster, or leeches. The feet should be kept warm by hot-water bottles. As a rule habitual sufferers prefer to be left in absolute quiet and not to be disturbed by any local application.

A large number of drugs are accredited with specific powers in giving relief; among the most important are phenacetin, phenazone, acetanilide, caffeine, and bromides; and these in various combinations are often used with success if administered at the time of the attack.

2. **Treatment between the Attacks.**—An exhaustive physical examination and inquiry is called for in every case, and any possible exciting factor corrected. This is the most important point in the successful treatment of many cases. The occurrence of an attack depends so much on general health, that attention to this, to any anæmia, constipation, or gouty condition, is of the first importance.

The eyes, too, should be carefully examined, and errors of refraction attended to, not only the more marked errors, but even the slighter degrees of hypermetropia and astigmatism.

The teeth, nose, ears, all require careful inspection, and attention should any abnormality be found. Disorders of the digestive and urino-genital systems must be borne in mind. But even when all these possible factors have been eliminated, there yet remain a certain number of cases in which the migraine returns periodically without any very definite cause.

Diet.—Regulation of diet is of the first importance. The patient should be instructed to have meals regularly, long intervals between food should be avoided, and a short rest be insisted on before the meal is begun. Many patients are benefited by being placed on a diet in which animal food is eliminated or greatly diminished. In some cases, however, this form of diet is not only not beneficial, but the frequency of the attack is actually increased. In such cases a simple meat diet may be advised. (*See also* HEADACHE.) Patients are, as a rule, better without alcohol in any form, but wine and whisky may be allowed when it seems to improve the general condition. An alkaline water such as lithia, Vichy, or Contrexéville may be taken with advantage with meals, and a small dose of sodium iodide (2½ gr.) added to this often proves beneficial.

Mode of Life.—The patient should be instructed to avoid as far as possible all mental and ocular fatigue, should lead a quiet, regular life with moderate outdoor exercise, and should avoid hot, crowded, and smoky rooms.

Drugs.—The remedy which, when taken during the interval, tends more than any other to delay the return of the attack, is nitroglycerin. This may be given in ½- to 1-min. doses of the liquor trinitrini, twice a day, the dose being gradually diminished to the smallest amount that suffices to ward off the attacks or to diminish their severity or frequency. The drug may be given in the following mixture:—

℞					
	Liquoris Trinitrini	♏vj	Acidi Phosphorici Diluti	℥iij
	Tincturæ Nucis Vomicæ	℥j	Aquæ Chloroformi	q.s. ad ℥vj

Ft. mist. One tablespoonful to be taken at 9 a.m. and 9 p.m.

Or nitroglycerin can be conveniently administered in tablet form, one tablet, containing $\frac{1}{200}$ to $\frac{1}{100}$ gr., being taken twice a day.

At the same time it is well to recommend the patient to take half a pint of hot or cold water every morning directly after rising. This form of treatment is very simple; it can be carried out without inconvenience over long periods, and has in my experience been attended by very good results. The treatment of some cases of migraine by the administration of thyroid has been attended by success. In other cases, such drugs as the bromides, gelsemium, cannabis indica, arsenic, and strychnine do good.

Counter-irritation.—Blisters or other forms of counter-irritation may be used, and the insertion of a 'seton' has been advocated in intractable cases, and is said to have prevented the attacks so long as the seton was in position. (*See also* HEADACHE, *and* SETON, TREATMENT BY.)

F. E. Batten.
(*Revised by Edwin Bramwell.*)

MITRAL DISEASE.—(*See* HEART, VALVULAR DISEASES OF.)

MOLLUSCUM CONTAGIOSUM.—Treatment of this condition depends on the number and size of the lesions. If they are of some size and still moderate in number, they are best removed by the flat curved scissors. If they are very tiny, they may be squeezed out, and a drop of pure carbolic acid applied to their cavities. When the lesions are close-set, very numerous, and of considerable size, the writer can testify to the benefit following exposure to *x* rays, under which crops of sixty or more will disappear in two or three weeks.

According to Ormsby, of Chicago, it is sufficient to stir the contents with the point of a needle so as to cause slight bleeding. The lesions shrivel and disappear.

Norman Walker.

MORPHIA HABIT.—(*See* Drug Habit.)

MOSQUITO BITES.—Prevention by use of mosquito nets and suitable clothing is most reliable. Kerosene and many of the essential oils will keep mosquitoes off. Oil of lavender and pennyroyal are the most effective, but to many people these remedies are more objectionable than the mosquito bite. A mixture of such oils, as advised by Colonel Alcock, F.R.S., will be more successful than any single one, e.g. :—

℞	Olei Bergamotæ		Quininæ Sulphatis	gr. xx
	Olei Caryophylli		Spiritus Vini Rectificati	℥viij
	Olei Lavandulæ	āā ℥ss	Aquam	ad Oj
	Olei Terebinthinæ	℥ij		

This is much used in India. The irritation from mosquito bites is relieved by liquor ammoniæ, but all friction must be avoided. *C. W. Daniels.*

MOVABLE KIDNEY.—(*See* Kidney, Movable.)

MOUTH AND PHARYNX, MALIGNANT DISEASE OF.—Certain general considerations apply to the treatment of malignant disease of all parts of the mouth and pharynx, and it will be convenient to refer to these before giving the special procedures which may be necessary according to the anatomical situation of the growth.

VARIETIES OF MALIGNANT DISEASE.

Squamous Epithelioma.—This is by far the commonest tumour met with throughout the tract, from the lips to the œsophagus. It is indeed practically the only one occurring in any part except the tonsillar region.* It is a tumour of extreme inveteracy if left untreated or dealt with only at a late stage. It has a marked tendency to affect the neighbouring lymph-glands, so much so that *as soon as the diagnosis of the primary tumour can be made, lymphatic infection must be assumed to be present.* For a variable time the growth is limited strictly to the region where it begins. It then forms a *hard, well-defined* nodule or plaque in the superficial tissues, and projecting more or less beyond them. As time passes, a stage is reached at which the local resistance to the tumour seems rather suddenly to yield. The rate of growth increases, the tumour becomes *ill-defined*, and usually softer. This change—the onset of *submucous invasion*—is of great gravity as regards the curability of the disease. It occurs ultimately in all cases, and the variability in its time of onset is the chief reason why the prognosis of, for example, cancer of the tongue has in the past been so baffling, The well-known nodular variety of cancer of the tongue, in which the disease from the start presents a mass growing into the tongue substance from the deep surface of the mucous membrane, with little external projection or ulceration, is a typical instance of precocious submucous invasion, and has a correspondingly sinister reputation for malignancy. Growths with a large amount of external fungation or cauliflower-like projection usually have but little submucous invasion, and are therefore often relatively easy to cure in spite of their alarming appearance.

Great stress is here laid upon the presence or absence of submucous invasion, because it is the most important fact in designing the treatment of a given case. If invasion has not begun, and the growth is hard, well-defined, and relatively prominent, while the

* The nasopharynx is not dealt with in this article.

glands, if palpable, are also hard and distinct, the disease can *almost certainly* be arrested by an operation of quite moderate severity. If invasion has occurred, although the growth may yet be comparatively small and the glands not palpable, a severe operation is necessary, and the outlook even then much less certain.

Generally speaking, a growth in the superficial stage may be cured by a local removal which includes a margin of healthy tissue of at least half an inch everywhere beyond the extreme limit of palpable induration. The part removed must have the growth at its centre, and must not be determined by the anatomical structure of the region. The older type of operation, which was designed in accordance with the anatomical features (excision of the tongue or half the tongue, laryngectomy, etc.), must therefore be replaced by a pathological type of operation in which the determining factors derive from the pathological peculiarities and requirements of the disease in the given case.

When definite submucous invasion is present, the half-inch margin is quite useless, and must be at least doubled in all directions, while in certain directions in which the disease is known by preference to spread, it must be further extended.

In every case, whether early or late, superficial or diffuse, a gland operation must be done. It should be bilateral, and should include all the fat, glands, and connective tissue of the region, dissected in one mass. When the glands are not palpable, the limits of the dissection are the level of the cricoid below, the posterior border of the sternomastoid behind, and the attachment of the mylohyoid above. The base of the parotid should be cut across at the level of the angle of the jaw. When the glands are palpable, the dissection must begin below at the clavicle, and should include the whole of the sternomastoid and the internal jugular vein. It is not usually safe to remove both internal jugular veins. The one on the side less affected should be spared.

As long as operation is feasible, it is the only treatment which should be considered in cases of epithelioma. When the condition is so far advanced that the tumour cannot be removed with any reasonable prospect of a satisfactory result, treatment by radium implantation is sometimes desirable. The selection of suitable cases and the technique of the treatment are matters which should be left to those having special experience. The actual procedure of inserting radium into an epithelioma of the mouth or pharynx should never be regarded as a trivial matter, for very small defects in technique may result in the patient's condition being made very much worse by the treatment. In general, it may be said that surface applications are quite useless, and that implantations should be done through an external wound, the maintenance of asepsis in which is of absolutely vital importance.

Sarcoma.—Malignant connective-tissue tumours may be regarded for practical purposes as occurring only in the tonsillar region, either in the tonsil itself or in the pharyngeal wall close to it. Three groups of such tumours may be distinguished: (1) The round- and mixed-cell sarcoma; (2) The lymphosarcoma; and (3) The endothelioma.

1. *Round- and Mixed-cell Sarcoma.*—The first group occurs chiefly in the tonsil; the tumour grows rapidly, is often surrounded by much œdema and duskiness of the mucous membrane, and ulcerates readily. Gland involvement is not constant, and is sometimes absent even at a late stage.

This group, in cases without extensive gland involvement, is the only one which can readily be dealt with by operation with a fair chance of cure.

2. *Lymphosarcoma.*—The second group affects the tonsils or the lymphoid tissue of the base of the tongue, and sometimes both. Ulceration does not occur early, but gland involvement is early and marked.

Lymphosarcoma, if at all advanced and showing the extensive bilateral gland affection which is almost always present, is rarely accessible to operation. Fortunately, most of the non-epithelial tumours of the tonsillar region are very susceptible to radium treatment, and yield rapidly to implantation or even to surface application. The position of radium in regard to the treatment of these tumours is entirely different from that it occupies towards the treatment of epithelioma. In the former case it must be taken into consideration as a primary method of treatment. The final decision, and the technique used, must, however, remain essentially matters for the expert.

3. *Endothelioma.*—The third group is peculiar in that the tumour is apt to be

associated with inflammatory signs, or even suppuration, at an early stage. Gland involvement is practically constant, except in the earliest stages.

If removed early, before the capsule of the tonsil is penetrated and before gland enlargement has occurred, endothelioma is very favourable, but on the other hand it is very difficult to recognize. At a later stage it seems almost impossible to eradicate by even the most extensive operations.

GENERAL PRINCIPLES OF OPERATIVE TREATMENT.

A proposed operation for cancer of the mouth or pharynx has necessarily to be considered by the patient and the practitioner with especial regard to the *prospect* of cure it affords, the *danger* it involves, and the amount of *permanent mutilation and disability* it produces. The first and third of these features are obviously the most important. It has already been pointed out that fairly definite prognosis is often possible if careful attention is paid to the type of growth and its stage of advancement; and it may be repeated here that a tumour of the superficial localized type should be regarded as normally curable, and that the presence of enlarged glands, if they are of the same type, cannot be regarded as affecting the prognosis at all gravely—provided, of course, that an operation of the modern type is done. It may be added that the tendency to replace the older operations of excision of some given organ by operations designed completely to remove some given tumour, has already diminished the necessity for therapeutic mutilation which has given to cancer of the tongue or throat a large part of its terrible reputation. If an operation gives a reasonable chance of cure, without serious permanent disability, it is clear that the amount of risk to life it involves is comparatively a secondary consideration when the disease for which it is advised is necessarily fatal if left untreated. As a matter of fact, the actual danger of operations undertaken in cases where there is even a moderate chance of eradicating the disease is quite small; and unless there is some special complication present, the question of risk should not be the predominating factor in a decision which in former times it of necessity was. There can be no doubt that even at the present time, the resources of surgery in the treatment of cancer of the mouth and pharynx, especially of the latter, are underestimated, and that a certain number of cases are watched until the disease is inoperable, in the full belief that cure is from the earliest period impossible.

Dangers of the Operation.—Operations about the mouth and pharynx, when properly conducted, appear to cause less *shock* than similarly extensive procedures elsewhere. It is quite rare for any serious anxiety to arise on this account, even after very severe operations. Similarly, *primary hæmorrhage* is very rarely serious or even troublesome. The formal preliminary ligature of vessels is, in the writer's opinion, unnecessary, but measures must always be taken to preserve the air-passages from the entry of blood.

The one serious danger is *sepsis*. It may take the form of acute septicæmia due to infection through the fresh wound-surface; of pneumonia with gangrene of the lungs; or of local infection of the wound, with cellulitis of the neck which may spread to the mediastinum. The first two conditions are almost necessarily fatal, and are usually manifest within forty-eight hours of the operation. Infections of the neck and mediastinum are extremely serious in themselves, and always accompanied by a special risk of secondary hæmorrhage.

Pulmonary Infection.—This is unquestionably due to aspiration of infective material into the lungs during the operation. Anything, therefore, which interferes with the airway, and consequently increases the force of suction at the upper laryngeal opening, is a source of danger. The more septic the mouth and growth, the more the growth is disturbed, the more the airway is restricted, and the longer the operation, the greater is the danger of pneumonia. The most efficient precaution against this complication is a preliminary laryngotomy or tracheotomy, with efficient plugging of the pharynx. This procedure is easy, quickly performed, and, in itself, quite free from risk.

Local Infection.—All fresh wounds exposed to contact with oral or pharyngeal mucus necessarily become infected. The infection runs a specific course: superficial sloughing always occurs, suppuration sets in about the fifth or sixth day, while by the tenth the sloughs have separated more or less completely and the wound is granulating. The granulating surface is immune to further infection. The severity of the process is

dependent on the degree of sepsis in the mouth and growth, and the extent and complexity of the wound. If the mouth is septic the infection readily becomes uncontrollable, especially if there is the least chance of imperfect drainage in the wound.

The danger of local infection is directly proportional to the distance of the seat of operation from the lips. Operations on the lips and cheek are practically free from such risk; operations on the free part of the tongue have a slight, but almost negligible, liability to serious infection; while operations on the posterior third of the tongue, the tonsillar region, and the rest of the pharynx, bring with them very grave dangers from this source.

Disinfection of the Mouth.—It will be seen that the two great dangers of treatment, pulmonary and wound infections, are traceable to sepsis in the mouth and in the ulcerating surface of the growth. The latter, however, is to a large extent dependent on the former, for the cleaner the mouth, the less is the tendency for the growth to develop the well-known foul ulceration. Sepsis is therefore essentially a consequence of the condition of the mouth. Experience of the larger operations, and especially those on the pharynx, shows that the difference in prognosis noticeable in patients who have teeth and in those who are edentulous is so great as scarcely to be capable of exaggeration. The condition of the teeth is much less important than their presence.. As long as any teeth are present, even if there be no evident infection of the gums, any of the larger operations may be followed by serious sepsis; whereas edentulous patients scarcely ever give rise to any anxiety in this respect. It is remarkable that the effect of the loss of all the teeth does not become manifest for some considerable time (several weeks at least) after their removal; so that, for example, if a patient who has had septic teeth removed is operated on as soon as the gums have healed, he will be found still to be liable to severe wound infection.

The ordinarily-prescribed preparation for operation, as by scaling the teeth, removal of stumps, cleansing by brushing and dental silk, is shown by experience to be of very little value as a preventive of sepsis after any of the larger operations.

In persons over fifty, such teeth as are present can only be an increasing source of trouble, and there is little doubt that a complete clearance of the mouth at about this age has a great deal to be said for it on general grounds. It is certain that if an edentulous mouth were normal at the age at which the incidence of cancer in the upper alimentary tract reaches its height, the mortality of operations for this condition would be enormously reduced.

Supposing the patient not to be edentulous, the first care of the practitioner, as soon as he suspects the existence of cancer, should be the condition of the mouth. In the majority of such patients the teeth and gums will show ample reason for energetic treatment, and as a rule but little persuasion is needed to get the patient to assent to radical measures. The urgency of the matter lies in the fact that the longer the interval between the loss of the teeth and any operation that may be necessary, the less the danger of such operation will be.

If the growth is small, and on the anterior part of the tongue, extraction of all teeth may perhaps be dispensed with, and the ordinary measures used; but if the growth is large, situated far back in the tongue or in the pharynx, this indulgence cannot be allowed.

Essentials of the Operation.—Every operation undertaken for malignant disease of the mouth or pharynx may be regarded as divisible into certain definite stages, each distinct from the others and having a well-defined share in the attainment of a successful result. In all the larger operations, the most important phases are as follows:—

1. Safeguarding the airway, if necessary by laryngotomy or tracheotomy and plugging the pharynx or larynx.

2. Digital examination of the growth, to determine as far as possible its exact situation and extent, and to decide upon what route shall be followed in exposing it.

3. The exposure of the growth. It should be kept very clearly in the surgeon's mind that this must be a distinct step in the operation, to be completed before any attempt to remove the tumour is begun. All methods which involve an attack on the tumour before its mucous surface is freely exposed, tend to lead to confused and inadequate operating.

4. The removal of the tumour with an adequate margin of healthy tissue according to the nature of the case.

5. The restoration of the parts to the normal, as far as may be, by the use of such plastic procedures as are possible. If the gap left by the removal of the tumour cannot be completely closed, raw surfaces liable to contact with oral or pharyngeal mucus must be reduced as far as possible, and the wound left in a condition favourable for the handling of infective complications.

Certain general precautions must be maintained throughout the operation. Every effort should be made to avoid unnecessary handling of the growth, or any manipulation which exposes it to squeezing or laceration. Raw surfaces, especially such as are to be closed, must be rigorously protected from contact with mucus or other septic matter, and from the risks of implantation of cancer cells from the tumour. As soon as the tumour is exposed, its surface should be destroyed with the actual cautery or freely swabbed with pure carbolic.

TREATMENT OF INOPERABLE MALIGNANT DISEASE.

The decision that a given case of cancer is inoperable involves a very grave responsibility, and should never be made without careful consideration of all the features of the case. The difficulty of coming to a just conclusion is added to by the natural shrinking of both patient and surgeon from the infliction of an operation which, if wrongly decided upon, is certain to add to rather than diminish the sufferings entailed by the disease.

Supposing, however, a decision against operation has been come to, treatment by radium may next be considered. In cases of epithelioma, such treatment has not often much to offer, and should never be entered upon lightly (*see* RADIUM THERAPY).

If purely palliative treatment alone is available, the control of sepsis is by far the most important line to be followed. Of measures designed for this, the reduction of dental sepsis is the most efficient, and it is often desirable to deal with this source of infection once and for all by clearing the mouth if there are but few teeth. The extraction of a large number of teeth is, of course, quite a serious procedure in enfeebled persons, and should not be advised without due consideration. There can, however, be no doubt at all that the complete clearance of the mouth has an extraordinarily favourable effect on ulcerating carcinomata of the mouth and pharynx, and that it gives more relief than any other procedure whatever. When the ulcer is accessible, local treatment of it may do much to relieve pain and fœtor. The surface may be gently mopped, and then thickly powdered with orthoform. Occasional swabbing over with pure carbolic is sometimes of great value. If a large cavity is present, it may be filled with powdered boracic acid every few days. This has a powerful antiseptic action, but the sodden powder is sometimes difficult to clear away.

When pain is severe, morphia must be used. It may be combined with small doses of atropine when salivation is marked. A great deal can be done by the judicious use of these two drugs, often in surprisingly small doses. When the growth is in the tongue or floor of the mouth, persistent neuralgic pain in the inferior maxillary branch of the trigeminal nerve usually comes on sooner or later. For this, the nerve should be injected with alcohol at the foramen ovale, a comparatively simple procedure which may give complete relief, and is greatly to be preferred to the intrabuccal division of the lingual which used formerly to be advised.

When the growth is in the pharynx, tracheotomy is necessary sooner or later. It can always be done under local anæsthesia, and should invariably be preferred to laryngotomy. But little can be done by way of local treatment of the growth ; the control of sepsis in the mouth, however, undoubtedly influences the rapidity and foulness of the ulceration. Salivation and difficulty in swallowing mucus, with resultant distressing cough, are common, and are best controlled by small doses of morphia and atropine subcutaneously. It is important to remember that irritative cough can often be controlled by a dose of morphia ($\frac{1}{12}$ gr.) so small as to produce none of the narcotic and after-effects of the drug. In the late stages of the disease, abscesses frequently form in the neck. They can usually be drained through a simple puncture, which, if made with a narrow, sharp knife over thinned skin, is practically painless.

Applications of radium, in doses not calculated to produce any considerable effect on the growth, are sometimes of value for the relief of pain.

Palliative operations are of very little value in cancer of the mouth or throat, and should rarely be undertaken. It occasionally happens, however, that a small growth in the mouth gives rise at an early period to inoperable gland disease. In such a case the primary growth may sometimes be removed, when this is possible without an extensive operation.

In conclusion, a word of caution may be added as to the difficulty of estimating the probable duration of cases of inoperable carcinoma. The disease, although in the long run always progressive, varies greatly in its course in different patients and at different times. Occasionally it seems even to retrogress for a time. Attempts at exact prognosis are therefore of very little value. (*See also* CANCER, GENERAL TREATMENT OF.)

OPERATIVE TREATMENT OF SPECIAL REGIONS.

Epithelioma of the Lip.—When the disease is of slow growth and superficial, or when it is definitely papillomatous, a comparatively small operation is adequate. The tumour is excised with a margin of a third to half an inch on all sides, and the parts are brought together. In order to do this it is generally necessary to make incisions outwards into the lip from the lower angles of the gap left by the incision. The resultant triradiate incision is closely stitched on its mucous and cutaneous aspects. No dressing is necessary. A gland dissection is always necessary, the submaxillary as well as the submental regions being dealt with. The submaxillary salivary glands are of course removed, and it is as well to carry the dissection as far back as the internal jugular vein.

When the growth is diffuse and of rapid course, a much more extensive resection of the lip is necessary, including all the structures superficial to the bone as far down as the base of the jaw. This operation may be combined with the gland dissection. The lip is reconstituted by sliding up flaps from the neck. Satisfactory results are not to be expected unless the newly-formed lip is provided with skin on its buccal as well as upon its facial surface.

Epithelioma of the Tongue and Mouth.—The three common places where epithelioma starts in the mouth are the lateral border of the tongue, the sublingual fold, and the gum about the molar teeth. Any chronic, progressive, localized lesion in either of these situations beginning in a middle-aged or elderly man is more likely to be epithelioma than anything alse. Elsewhere in the tongue the disease may start on the dorsum (when it is usually preceded by chronic syphilitic lesions), close to the anterior faucial pillar, or on the posterior third. In the second case, it may be regarded as belonging to the tonsillar group, and in the third case the tumour is essentially pharyngeal.

Dealing here with growths of the dorsum or lateral margin of the oral part of the tongue, treatment is to be designed according to the nature of the disease. If it is of the superficial localized type, excision with a full half-inch margin is adequate. To carry this out properly it is usually necessary to divide the cheek, a procedure which leaves a scarcely perceptible scar if the wound is properly sutured. The wound in the tongue should always be closed with mattress sutures of catgut. Unless the surfaces are brought together, hæmorrhage and sloughing may occur. Mere suture of the mucous membrane edge to edge is quite useless. In these cases it is usually best to do the (bilateral) gland dissection first, and to deal with the primary growth at an interval of ten days.

When the growth shows distinct submucous invasion, or involves the floor of the mouth, or has begun on the sublingual fold, the jaw must be divided to give adequate access, and the growth, with an inch margin, must be removed, including the underlying muscles down to the great cornu itself. The mouth wound can usually be closed by turning the anterior part of the tongue back on itself. When the growth comes near to the jaw, the inner table of the bone must be sawn off and removed with the tumour. Some infection of the divided ends of the jaw frequently occurs, but the advantages of free exposure quite compensate for this.

In these cases, also, the gland operation should be done first, though there is a certain risk of pneumonia arising as a result of aspiration of septic material during the long and difficult neck operation. The best precaution against this danger is the administration of the anæsthetic by the intratracheal method.

After the operation on the primary growth, the patient should be sat up in bed, fed by a rubber catheter passed into the œsophagus when necessary, and the mouth should be syringed out from time to time with dilute peroxide of hydrogen. All trouble from hæmorrhage is prevented by proper suture of the tongue wound. A laryngotomy should usually be done as a preliminary, but the tube is removed at the end of the operation.

Epithelioma of the Tonsil and Tonsillar Region.—This group includes growths of the anterior pillar, of the tongue close to the pillar, and of the posterior third of the tongue. The best access is obtained by dividing the jaw at the anterior border of the masseter. This enables the growth to be fully exposed on its mucous aspect, and its downward extension defined and dealt with. The bone is exposed by a flap outlined by an incision carried through the middle of the lower lip and then outwards just below the base of the jaw. The wound left by excision of the tumour can usually be completely closed, and often union is obtained without any leakage from the pharynx. Growths of the posterior third of the tongue are also to be reached by this method. They are, however, very difficult to eradicate, as they tend from the first to be of the deep-seated, diffuse type. The order of primary operation and gland operation is often difficult to decide upon. If the glands are not at all or but little enlarged, they may be dealt with (on both sides of the neck) first. If there is doubt as to the operability of glands or primary growth, the more doubtful should, of course, be dealt with first. In some cases, however, the size of the glands may be such that they prevent access to the primary growth, and then they must be removed first. Experience has shown that strictly unilateral growths of the tonsillar region and of the upper opening of the larynx are much less likely to cause bilateral gland infection than are similar growths of the tongue. While general opinion is therefore undoubtedly correct in enjoining the bilateral gland operation for carcinoma of the tongue, it is probable that the unilateral gland operation will prove adequate for early carcinoma of these parts of the pharynx.

Epithelioma of the Laryngeal Opening.—This is a form which tends to produce symptoms early, and is therefore very favourable in the results it yields to operative treatment.

Access is obtained by lateral transthyroid pharyngotomy, the ala of the thyroid and the great cornu of the hyoid on the diseased side being removed before the pharynx is opened. Necessarily, therefore, the gland operation must be done first, or combined with the primary operation, a procedure which is quite feasible if only the unilateral gland dissection be done, the other side of the neck being reserved for a second stage. The growth, which occupies the epiglottis or aryteno-epiglottic fold, can, if operable with any reasonable chance of cure, practically always be removed without a total laryngectomy, so that speech can be preserved—a matter of the very greatest moment.

After free exposure and removal of the growth, the wound left is firmly closed by mattress sutures, and then the wound of access in the pharyngeal wall is stitched. As a rule, it is necessary for the tracheotomy tube to be kept in for about a week. If the pharyngeal wall is properly closed, leakage does not occur. Very rapid healing is then attained.

Epithelioma of the Laryngeal part of the Pharynx.—There are two very distinct types of disease found in this region—viz., growths of the pyriform sinus, and growths of the tubular part of the pharynx behind the cricoid cartilage.

The pyriform sinus type of growth is a common disease of middle-aged and elderly men, and, owing to the frequency with which it is overlooked in the early stages, it is one of the gravest forms of malignant pharyngeal tumour. It is desirable, therefore, that some reference be made to diagnosis. The tumour begins in the deep recess of the pharynx which lies between the ala of the thyroid externally and the lateral wall of the larynx internally. It therefore invades the thyroid cartilage at an early stage, penetrating it and forming a swelling externally, which is either overlooked, mistaken for a gland, or regarded as being due to syphilitic perichondritis. Internally, its growth causes a smooth, rounded swelling of the lateral wall of the larynx, surmounted by an œdematous aryteno-epiglottic fold, and often mistaken for a gumma. No ulceration is visible on the laryngeal aspect; such ulceration as is present in the early stages is, of course, entirely pharyngeal, and deeply buried in the pyriform sinus, so that it is usually quite invisible to laryngoscopic examination.

In the early stages of the disease adequate removal is possible without total laryngectomy. The ala of the thyroid must be excised, and the lateral wall of the larynx on the diseased side. The cricoid ring can usually be left intact.

In a late stage a diffuse subperichondral infiltration occurs, and a total laryngectomy must be done.

Later still, the lateral and posterior pharyngeal walls are affected, and removal is possible only by a large laryngo-pharyngectomy, followed by a plastic reconstitution of the pharynx. It is doubtful, however, whether such operations are to be advised, seeing that the chance of cure is so small as scarcely to be appreciable.

Growths of the tubular part of the pharynx (post-cricoid or hypopharyngeal tumours) are also common, and remarkably prone to occur in women, and at a relatively early age. Here also the results of operation are bad because diagnosis is not made so early as it should be. Any complaint of pharyngeal symptoms of a persistent kind should always lead to rigorous examination by an expert in the use of the modern direct methods.

The operative treatment of these cases at an early stage of the disease, although difficult and complex, is not merely feasible but remarkably encouraging. No details of the procedures need be given here ; but it may be remarked that they should always include free exposure of the tumour, and provision for reconstituting the pharynx by a skin flap. Unless the surgeon is prepared to proceed at once to a plastic operation of this type, he is apt to be disinclined to excise the tumour freely enough to give a satisfactory result.

Wilfred Trotter.

MUCOUS DISEASE.—(*See* Dyspepsia in Childhood.)

MUMPS.—The painful swelling of the parotid glands will be relieved by the application of hot fomentations with a few drops of laudanum sprinkled upon them, or of glycerin and belladonna.

Pain may also be allayed and sleep afforded by Dover's powder or laudanum, the dose being according to age. When there is orchitis, the testis must be supported and hot fomentations applied. In severe cases, the application of ice will answer better. If these measures fail to give relief, the testis should be incised. The organ should be brought out through a 2-in. vertical incision in the tunica vaginalis, and the tunica albuginea slit in a dozen places ; the incisions should not be over $\frac{1}{4}$ in. in length, should only just go through the tunica, and should be parallel to the long axis of the testis. If necessary, the epididymis should be similarly treated. A drainage tube should be left in the tunica vaginalis, and the wound closed round it. The scrotum should be firmly bandaged. So far as I know, this operation has been performed in two cases only ; but in neither did the testis atrophy.

In some epidemics cases have occurred in which there have been symptoms indicative of acute inflammation of the pancreas, viz., sudden and intense pain in the epigastrium and left hypochondrium, vomiting, and collapse, and occasionally jaundice. Tincture of opium in 3-min. doses, in $\frac{1}{2}$ drachm of glycerin and water, should be given every hour, or more frequently if the pain is very severe.

Hydrotherapy will be found useful in those not common cases where the temperature is high and symptoms of excitation of the nerve centres are present ; with it may be combined a sedative mixture (*see* Fevers, Acute Infectious).

The patient should be kept in bed at least eight days, even in the mildest cases ; in severe cases, longer. He may be considered free from infection three weeks from the onset of the parotitis.

Quarantine period : twenty-five days.

E. W. Goodall.

MUSCLE SPRAINS.—(*See* Sprains.)

MUSCULAR RHEUMATISM.—(*See* Rheumatism, Chronic.)

MYALGIA.—(*See* Rheumatism, Chronic.)

MYASTHENIA GRAVIS.—This rare disease is characterized by muscular weakness, and by the facility and rapidity with which the muscles become exhausted as the result of both voluntary effort and faradic stimulation. Our knowledge as to its etiology

and pathology is at present uncertain, and no treatment is known which will with certainty arrest or cure it ; a good deal, however, can be done by palliative measures.

All unnecessary muscular effort should be prohibited, and especially is this the case as regards the muscles chiefly affected. If the symptoms are severe the patient must be confined to bed. Mental excitement of every kind is to be avoided. The patient should be warmly clad, as cold undoubtedly tends to aggravate the symptoms.

The feeding in these cases requires careful attention. When there is weakness of the muscles of mastication and deglutition, the larger portion of the food should be taken early in the day, for the weakness becomes more pronounced towards evening. The food should be of high nutritive value and be taken slowly. Solid food should be minced in order to spare the muscles of mastication. It is possible that the lives of some fatal cases might have been saved had this precaution been attended to, for asphyxia consequent upon the impaction of an unchewed bolus in the throat has in several cases caused death. Where dysphagia is pronounced, rectal feeding is preferable to the stomach tube, the passage of which is apt to produce great exhaustion.

Faradism is on no account to be used, since it increases the 'myasthenic state'. Very weak galvanic currents applied to the affected muscles have been said to do good in some cases, and may be employed. Massage appears to be of no service.

Drug treatment is unsatisfactory. There is no agreement as to the beneficial effects of any one remedy. Various drugs—among which potassium iodide, hypodermic injections of strychnine, and thyroid extract may be mentioned—have, it is affirmed, done good in individual instances ; but the relapses and intermissions which are so common, in the absence of any detectable exciting cause, render therapeutic deductions difficult. The writer has seen a large number of drugs employed, but has not been able to convince himself in any case that improvement was the direct consequence of the 'remedy'. Arsenic and strychnine may be given as a general tonic.

Strümpell points out that attacks of dyspnœa, which when they occur have such serious prognostic significance, are sometimes relieved by pulling forward the tongue. In a severe attack when there is great weakness of the respiratory muscles, artificial respiration may be called for. *Edwin Bramwell.*

MYCOSIS FUNGOIDES.—Arsenic was formerly the only treatment which had any influence, and that only a retarding one, on the fell progress of this disease. Since, however, in 1902, Allan Jamieson first demonstrated the wonderful effects of *x* rays, that treatment has practically taken the place of all others. Under suitable exposures the ulcerated surfaces heal up and tumours melt away as if by magic. Every fresh outbreak must be treated, and these are frequent ; but watchfulness and steady perseverance in the occasional use of the rays are successful in restoring the victim to, and keeping him often for many years in, a state of comparative health and capacity. *Norman Walker.*

MYELOMATA.—(*See* Bone, Tumours of ; Jaw, Tumours of.)

MYOCARDIAL FAILURE.

Rest.—In the great majority of cases of cardiac muscle failure, bodily rest is an essential part of the treatment, and *alone* its influence, by no means very rarely, determines a profuse diuresis when there is dropsy. The diminution of work on the part of the heart implied by such rest is sufficient to enable the organ to recover its vigour and again to perform its functions efficiently, so that venous stasis ceases. A few years ago much was heard of the treatment of heart disease by means of baths and graduated exercises. It is in certain cases of slight cardiac muscle failure that this treatment is most likely to prove useful—in cases of a heart muscle that has become 'flabby' and lost its tone. In many such cases, no doubt, the disturbance of the circulation is not all central, i.e., cardiac, in origin, and blood conditions, probably in the direction of plethora, may play a part. As far as the 'exercise' part of the treatment is concerned, it is worth noting that as long ago as 1854 Dr. Stokes, in his book, *The Diseases of the Heart and of the Aorta*, refers to a patient whom he advised "to pursue a system of graduated muscular exercises", and remarks that "the symptoms of debility of the heart are often removable by a regulated course of gymnastics, or by pedestrian exercise even in mountainous

countries"; but Dr. Stokes's use of the expression, 'debility of the heart', clearly designates the type of case that was in his mind's eye. By sedentary occupation and abstinence in the matter of exercise, combined with a vigorous digestion and good appetite, it is easy for certain individuals to pass into a condition that may be regarded as the most remote from the desirable one, known as 'fitness' or 'training' among the athletic. No one expects 'good wind' in a stout person, and his 'bad wind' is to be attributed largely to the condition of his heart, which, however, cannot be regarded as 'diseased', but only as temporarily 'debilitated'. Moreover, there are factors other than cardiac that have to be reckoned with in the circulation; for instance, the quantity and quality of the blood, the state of the tissues of the body, including the capillary walls, peripheral resistance, and the musculature of the chest wall. Upon these, graduated exercise, diet, and general regimen may be expected to exert special influence.

When, however, the heart muscle is failing intrinsically, it is surely irrational to impose upon it a heavier burden. If a patient has severe dyspnœa on exertion, and, still more, if he has dropsy and a congested liver, there can be no question as to the absolute necessity of rest. But he may have neglected early warnings and have struggled on till his dyspnœa has become *orthopnœa*, and he is no longer able to lie down. In a hospital ward, into which heart cases of this kind are quite commonly admitted, it is a very rare thing to find a patient really unable to remain in bed with his shoulders well raised and supported on a 'bed rest' or pile of pillows. In the paroxysm of dyspnœa that occurs in certain cases of Cheyne-Stokes respiration, the patient will sometimes spring out of bed as the dyspnœal period reaches its maximum. In the circumstances, the hypodermic injection of morphine and atropine will usually be effectual in allaying the distressing condition, and enabling the patient to remain in bed. When a patient is incapable of passing the night otherwise than sitting on a chair, leaning forwards, supported on the back of another chair, his greatly œdematous legs swelling till the tense skin cracks and exudes serum, his plight is very terrible, and treatment very difficult. Care must be taken that he does not bury his face in a pillow or in his sleeve while his neck is sharply bent, and so become asphyxiated. The presence of much secretion in the bronchial tubes renders morphine dangerous; moreover there will usually be serous effusions that directly or indirectly interfere with the action of the heart and lungs. Such effusions may be mechanically removed, while the presence of secretion in the bronchi need not absolutely forbid the use of morphine, though it necessitates an infinitesimal dose being given, and that well guarded by atropine or strychnine as a respiratory stimulant. Moreover, dry cupping over the lungs is often useful in the circumstances. By these means it may be possible to get the patient once more to remain in bed. But in truth, the condition described may often be anticipated by treatment, and its full development is most often seen in patients who have struggled on without, or in spite of, medical advice. Digitalis, strophanthus, and allied drugs are much more likely to bring about a diuresis when the patient is recumbent, or at any rate in bed with shoulders raised.

In the promotion of rest it is often useful to have two small beds, which can be brought up side by side, the patient being changed from one to the other night and morning. Although the changing entails movement, and even slight exertion, it may be that, on the part of the patient, such movement and exertion are no greater than are involved in the ordinary 'making of the bed', while to neglect this last is often to produce 'soreness' of compressed parts, and ultimately bed-sores.

Hospital patients appreciate the use of a crossbar, suspended by a rope from the roof or a bracket on the wall, by which, especially in the case of heavy patients, movements of the body are greatly facilitated. No doubt the exertion entailed by the use of the crossbar is injurious, but compromise has to be made, and such exertion is to be weighed against the manœuvres requisite in lifting a heavy patient about, even when several skilled attendants are available, which is seldom the case in a private house. In the latter, the writer has occasionally had constructed by a joiner an apparatus resting on the floor, affording the patient the advantage of the hospital suspended crossbar. Though it may seem paradoxical to say so, the contrivance really tends to the promotion of *rest*. When some of the beds in a ward have the crossbar referred to and others are without it, patients with grave heart disease, and their nurses too, prefer the beds so provided. Another mechanical aid to the cardiac sufferer is supplied by affording him a resisting object

against which he may press his feet, and so raise himself up in the bed, or at least prevent himself from slipping down.

Diet.—In the treatment of cases of cardiac muscle failure, there is perhaps no part more important than the diet of the patient; and yet how often is this neglected, while, as the saying is, 'no stone is left unturned' in the matter of drugs. Yet the common experience of humanity—and especially of athletic humanity—teaches that the influence of diet on the heart muscle is immense.

That the heart is chiefly influenced in the process of training is rendered almost certain by the extraordinary improvement in 'wind' that is brought about. First in occurrence and first in importance throughout, in cardiac disease, is the symptom *failure of 'wind'*. While the heart muscle, which we know to possess many special and remarkable attributes of its own, is chiefly influenced by the process of training, of which dietetics form so important a part, muscles of the ordinary voluntary type no doubt share in the influence exerted, and especially, it is allowable to believe, the *respiratory* muscles. In one respect the old system of training may be open to criticism, in that the drinking of water was discouraged. The writer would mention in defence two considerations: that large draughts of water *with meals* are probably injurious, interfering with digestion, and that, as a matter of actual experience, a largely nitrogenous diet is *not conducive to thirst*—rather, he thinks, the opposite, *salt* meats of course being excluded.

One of the three cardinal symptoms of cardiac disease is engorgement of the liver—'venous stasis'—revealed by its swelling and tenderness. This condition of the liver no doubt interferes with the functions of its cells. These functions concern both carbohydrate and albuminous feeding; but it may be presumed, perhaps, that they concern the former rather more than the latter; at all events it will give relief to have one set of functions reduced to a minimum, while the other set is exaggerated. If the writer be wrong in attributing the major influence of the liver to be upon the carbohydrate constituents of the food, the reduction of these constituents will in any case leave the liver cells more energy to bring to bear upon the albuminous constituents.

In heart cases, again, as regards the digestion of the two great classes of food referred to, a strong argument in favour of a chiefly albuminous diet is the much greater tendency of the carbohydrate elements of food to produce flatulence, and every clinician knows the amount of distress this occasions to cardiac sufferers. For this distressing condition, the writer knows no treatment so effectual as the withdrawal of carbohydrates from the dietary.

It must not be supposed that a diet of 'beef and water' is advocated. Two considerations must be allowed predominance; one concerns metabolism chiefly, and has been already discussed, the other concerns primary digestion. Is the 'mixed meal' of modern life not based upon the fact that the average healthy individual has an excess of digestive power? Surely it will give relief to weakened digestive organs (and who can doubt that these are weakened in heart disease?) if, instead of the 'mixed meal', the albuminous and carbohydrate constituents of the food are given, as far as is feasible, separately? Fatty constituents may be given with either kind of meal; for instance, butter and cream with breakfast, and fat with luncheon and dinner. If a beef-steak and a rice pudding are taken together, will not the latter interfere with the digestion of the former in the stomach, where the saliva must soon cease to act? No doubt in disease the digestion of albuminous food is often accomplished essentially in the intestine, and in an alkaline medium, as for instance in severe fevers; but in heart disease it is a common marvel how long gastric digestive power is retained apart from attacks of gastric catarrh.

Only *simplification* in the feeding of the cardiac patient is pleaded for as regards primary digestion: that he should avoid the 'mixed meal' of modern life. In primitive savage life, in all probability, man would eat his flesh food and his vegetable food separately, as he obtained them at different times and in different circumstances.

To carry out the principles referred to, the writer has for a good many years advocated, for cardiac patients who are still able to take ordinary meals (and with temporary exceptions this state may continue almost to the end of the case), the following dietary:—

Breakfast: Chinese tea, or weak coffee and cream; toast—the bread cut in thin slices and toasted slowly—buttered cold. Fruit: bananas, etc.

Midday meal : any kind of flesh food, plainly cooked, with green vegetables (preferably passed through a sieve after thorough cooking and pounding) ; custard pudding or junket with cream, or cheese fondue, if a second course is required.

At 4 or 5 o'clock p.m. a cup of Chinese tea and cream. Nothing to be eaten. No sugar to be taken ; if sweetening be required, saxin may be employed for the purpose. A very small piece of bread, thickly buttered (to check undue acidity) may sometimes be conceded.

Evening meal : similar to midday meal, the articles being changed.

No bread, no potato, and no farinaceous pudding on any account to be taken with the midday and evening meals.

Fruit, natural or cooked, without the addition of sugar, may sometimes be allowed after the midday and evening meals, as well as after breakfast. The writer believes that, whatever be the explanation, the carbohydrates of fruit, taken in moderate quantity, are less injurious than those of bread, potato, and farinaceous pudding.

There are certain circumstances that interfere with the adoption of such a dietary as has been outlined. Some individuals are intolerant of most fats, and on the other hand have great facility in the digestion of carbohydrates. Others, again, have an inveterate dislike to much flesh food, and two daily flesh meals are abhorrent to them. Compromise can generally be made without greatly departing from the principles of the dietary laid down. The cardiac sufferer may do well on a carefully regulated dietary comprehending only a minimum of flesh food, such articles as custard, junket, and fondues of cheese replacing it to a large extent.

There is a large class of patients whose habitual tendency is to take too large a quantity of both albuminous and carbohydrate food, and in addition to take too much fluid with meals. Usually the albuminous diet, detailed above, suits them, but if they insist on ' mixed meals ' these must be spare, and each should be *finished short of the feeling of satiety*. Another great class is composed of patients in whom cardiac muscle failure is associated with (one may say in most cases is secondary to) kidney disease. Although in chronic Bright's disease albuminous food is probably much better borne than theoretical considerations would lead one to anticipate, it seems hardly wise to throw an excessive burden on the function of damaged organs. *Small* 'mixed meals' are usually best in the circumstances, and it is possible that casein and even egg albumen are less injurious than flesh, though the belief that white flesh is less injurious than red to patients with Bright's disease has been too commonly and too rigidly held.

The good effects of an exclusive milk diet in the cardiac muscle failure of Bright's disease are generally admitted, but few patients will tolerate it for a lengthened period. The writer adds fruit to an otherwise exclusively milk diet in Bright's disease, and finds that it renders the diet very much more agreeable, and also serves to keep the bowels free—at least to obviate constipation.

In simple cases of cardiac muscle failure, attacks of gastric catarrh are common, as in cardiac cases generally, and for them 'koumiss' or fermented milk is often useful, but the patient must not have any other kind of food at the same time. Some patients dislike the taste of koumiss, and will not take it. For them, peptonized milk may be used to the exclusion of all other food. If koumiss and peptonized milk alike are vomited, the best plan is to let the patient fast for from six to eight, or even twelve, hours, at the end of which time the sickness has usually ceased, though feeding must be resumed only gradually. Counter-irritation—as by a mustard and linseed poultice over the epigastrium—is often helpful, or seemingly so. The gastric catarrh of heart disease is, no doubt, often set up in the first instance by some indigestible article of food irritating the venously congested mucous membrane.

Unsatisfactory as is feeding by the rectum, it may be used when it seems necessary to give the stomach absolute rest for a considerable time. Four ounces of milk with a teaspoonful of liquor pancreaticus (Benger) and a pinch of bicarbonate of sodium form a good enema. Even the throwing into the bowel of warmed normal saline solution renders a period of abstinence from food and drink more endurable. An acetone odour from the breath in gastric catarrh is probably associated with the starvation occasioned by the frequent vomiting.

Drug Treatment. — Among the drugs useful in the treatment of cardiac muscle

failure, digitalis is pre-eminent. The official preparations are all open to the objection that the crude drug from which they are made is more or less liable to vary in precise chemical constitution according to the soil in which the plant is grown, and many other pharmaceutical particulars. On the other hand, all are more or less and similarly active. So-called 'physiologically standardized' preparations have been in vogue of late, but the writer has always doubted such preparations being permanent—that is, incapable of undergoing subtle chemical change after the assay, and in course of time. To attain, as far as is possible, to precision in the administration of the drug, the writer for many years has used largely the granules of 'crystallized digitalin' of Nativelle, of Paris. The active principle they contain is unquestionably present in precise dose ($\frac{1}{240}$ gr. in each granule), but its action, of course, does not represent that of all the active principles contained in the crude drug, and it has one property—a so-called cumulative one—that is both useful and, in a measure, objectionable: useful, inasmuch as it is easy by the administration of the granules to bring the heart under its physiological effects; and objectionable, because the prolonged administration of even a small dose is apt to eventuate in a toxic effect upon the heart and also on the alimentary canal. Thus not only slowness and irregularity of the pulse may result, but be combined with abdominal pain and vomiting. The most desired effect of the drug in all its forms is an increased flow of urine—*diuresis*. But this may fail to appear before the manifestations of the objectionable effects referred to, and yet when, owing to the latter, the administration has been stopped for a day or more, profuse diuresis may set in and continue for a considerable time. It may be imagined that the drug has acted too energetically upon the arterioles in the first instance, so that in the kidney the requisite conditions for diuresis fail, and occur only later, when the effects of the drug have to some extent passed off. Whether this explanation be correct or otherwise, it accords well with the clinical facts. Another, fortunately rare, observation with regard to the effects of digitalis is the abrupt supervention of a very profuse diuresis, which, however, is not maintained and cannot be re-established. In exceptionally severe and urgent cases, the writer prefers a freshly-made infusion of the crude drug, 3 or 4 drachms of which infusion he is careful to have given *every eight hours:* that is, three times in the day of twenty-four hours. On the other hand, he seldom gives more than two of Nativelle's granules in the twenty-four hours, one night and morning being usually the dose. Should he wish, however, to give a larger amount, he is careful to divide three granules equally over twenty-four hours, i.e., to give one granule every eight hours. In exceptional cases it may be desirable to push the action of the drug, and to give four doses in the twenty-four hours: a granule or 3 drachms of infusion every six hours. It seldom happens that as much can be taken for long without indication arising that the dose must be diminished, and during the administration very careful observation of the patient, *who must be in bed*, is necessary.

It is the custom of the writer to diminish the dose, after a varying time, during a course of the drug—for instance, to give a Nativelle's granule in twelve hours (twice daily) for a week, and then one in twenty-four hours for the following seven or ten days. Afterwards the treatment may be stopped, or a granule be given once in forty-eight hours for some time longer. In this way the cumulative property of Nativelle's granules may actually be utilized. Recently a new granule of Nativelle's 'crystallized digitalin', *red in colour*, and containing only $\frac{1}{600}$ gr. (0·1 mgrm.) of the active principle, has been prepared. Mackenzie estimates the strength of the old white granule to be that of 15 min. of the tincture.

In certain cases in which there is indication of too great contraction of the arterioles and of a pulse of considerable tension, it may be desirable to give, during the administration of the digitalis, a vasodilator—say a tabloid of erythroltetranitrate ($\frac{1}{4}$, $\frac{1}{2}$, or 1 gr.), or a chocolate tabella of nitroglycerin, $\frac{1}{100}$ gr. or less, sufficiently often to keep up the physiological effect of the drug, and thus, as it were, to negative or diminish the influence of the digitalis upon the arterioles, which has probably been exaggerated. Moreover it is difficult or impossible to keep up a permanent vasodilator effect. While the administration of full doses of digitalis, under observation, for a short period, is usually quite safe, the prolonged administration of even small doses leads to toxic symptoms. Fortunately, abdominal pain, sickness, and vomiting are apt to supervene, and this last puts a stop to the further absorption of the drug, even if continued; but in certain cases in which quite

small doses have been given for a long time, the patient being allowed to go about meanwhile, there is grave reason to believe that the drug has contributed, at least occasionally, to a sudden death, if it has not indeed been the cause of it. Much has been written about the use of the drug in aortic incompetence, simply from one—the theoretical—point of view; the writer has no fear of giving it in cases of this lesion, and has obtained excellent results from it. The fear has been expressed that, the diastole being prolonged, more time would be afforded for the distention of the left ventricle by the regurgitated current of blood. In a case of slow pulse in this lesion, no digitalis having been given, the patient died suddenly. Had digitalis been given, it would have been impossible to eliminate the effects of the drug from the result.

The drug next to be considered in point of usefulness is undoubtedly strophanthus. If the action of strophanthus be exerted upon the heart essentially, and the musculature of the arterioles to a large extent escape, the drug should have a great field of usefulness in clinical practice, inasmuch as cases of relative heart failure in the presence of arterial tension and peripheral resistance abound. It can hardly be said, however, that the indication has proved of practical value. For instance, some of the best results the writer has had from strophanthus were obtained in a case of rheumatic disease of the heart in a young subject with mitral incompetence but without mitral stenosis and aortic valve disease, and with very low pulse-tension. There could be no question of *post hoc* rather than *propter hoc* in this case, inasmuch as the same result was *repeatedly* obtained. On the other hand, strophanthus has often failed in cases in which arteriole contraction seemed to play a predominant part. Moreover, the introduction into our therapeutic armamentarium of vasodilators would seem still further to enhance the usefulness of digitalis and diminish the application of strophanthus. Admitting all this, and that the indications for the use of the drug are still to a large extent empirical, the right of strophanthus to the second place in treatment may be cordially admitted. Mackenzie questions the power of digitalis to raise the blood-pressure in the clinical subject, and the writer's experience would tend in the same direction. Certainly such result is unnecessary for the diuretic effect of the drug.

It seems to be practically impossible to give any drug, with justice, the third place, though squill may be regarded in action as a weak digitalis. The writer admits, however, that he at least has hardly given drugs such as convallaria majalis and apocynum cannabinum (of which the preparation 'cymarin' is a convenient form) a fair trial, inasmuch as he has reserved their use for the worst cases of heart disease, which had resisted both digitalis and strophanthus. Citrate of caffeine, and still oftener diuretin (theobrominum natrio-salicylicum) and theocine, he has frequently found useful in setting up a diuresis in apparently most unfavourable circumstances. Generally he has regarded evidence of sound kidneys as an indication for the employment of the latter drugs, believing their action to be essentially exerted upon these organs. In at least one case of the heart failure of chronic Bright's disease, however, he has seen a profuse diuresis result from one of them. Whether the effect was dependent on the action of the drug upon the kidney or upon the heart, remained doubtful. Squill is often an important constituent of cough mixtures used in the treatment of heart disease, as for instance :—

℞ Tincturæ Opii Ammoniatæ		Syrupi	℥xl
Spiritus Lavandulæ Compositæ āā	℥xx	Aquæ Menthæ Piperitæ	℥lxxx
Syrupi Scillæ	℥lxxx		

Of the treatment of the complications of cardiac muscle failure this is hardly the place to speak; they are the complications for the most part of the venous stasis of heart disease in general. The writer deprecates the old custom of giving frequent purgatives in the treatment of heart disease, and especially with the object of removing serous effusion. There are cases, however, in which, notwithstanding the cardiac muscle failure, a considerable degree of vascular tension is maintained, and in which the cardiac failure may be said to be relative only. In such cases the occasional production of free purgation may have its use. Mercury is held by some to be of special value in diminishing peripheral resistance in such cases, calomel and pil. hydrargyri being the preparations usually employed. The antiseptic action of mercury in the intestine may also be of use. In place of a mercurial pill the following may be used as a purgative :—

℞ Euonymin	gr. j	Extracti Hyoscyami	gr. j
Iridin	gr. iij		

Fiat pilula.

Pulv. jalapæ co. has a great reputation as a desirable purgative in heart disease. The dose has often, especially in hospital practice, to be large. More or less constant purgation entails exertions on the part of the patient which must be harmful in the end, while means of lowering arterial tension without exertion are nowadays available (vasodilators). For pulmonary œdema, dry cupping is often of use: the cups should be large and effectively applied. A few leeches may be usefully employed over a congested liver that is causing more than usual distress. Exceptionally phlebotomy may ward off the threatening danger of an over-distended and failing right auricle. Tapping may be required when hydrothorax or ascites is manifestly interfering with respiration and cardiac action, and dropsical legs may require the application of Southey's trochars or acupuncture, which should be used only with great antiseptic precautions. With regard to the use of the trochars, the writer has been much struck by the difference as regards the flow of serum in individual cases *apparently* alike.

Insomnia may threaten the patient's life, and prove most difficult of treatment; resort to morphine and atropine hypodermically will often be the best course to adopt, and generally so, whenever an *element of dyspnœa* enters into the insomnia or is associated therewith. Under other circumstances paraldehyde may prove useful. The treatment of pure insomnia in heart disease is often a matter that causes great anxiety to the physician: as in typhus and pneumonia, if the patient be allowed to go sleepless night after night, he will die, while the forcing of sleep may entail risk.

The question of the treatment of chronic dyspnœa practically resolves itself into the treatment of the heart, and aims at the restoration of its vigour, as far as that is possible, with the removal of subsidiary conditions interfering with the play of the lungs, such as hydrothorax and ascites.

The dyspnœa, coming on in paroxysms, and probably associated with a general tightening up of the arterioles, requires special reference. It is usually relieved, to a greater or less degree, by vasodilator medication, such as the inhalation of amyl nitrite, or the internal administration of erythroltetranitrate, nitroglycerin, nitrite of sodium, etc. Alcohol, no doubt, acts largely like a nitrite, dilating the arterioles and so relieving the heart. When such remedies fail to relieve paroxysmal dyspnœa, with its violent 'struggles for breath', the subcutaneous injection of morphine and atropine is the only reliable mode of treatment; but the dose should always be very small at first, and be slowly increased in subsequent attacks, until relief is obtained. *Much blocking of the bronchi with secretion*, and *Bright's disease*, especially the former, are contra-indications as regards the use of morphine: in both cases, if the treatment be employed, the first dose must be infinitesimally small, and the subsequent doses must be increased with the greatest caution, and according to results. The presence of albumin, even in large amounts, must not of course be considered diagnostic of Bright's disease; in a heart case it may result from venous stasis of the kidneys simply.

Strychnine is a drug that has come greatly into fashion in the treatment of heart disease. Its action is probably an indirect one as far as the heart is concerned. Its essential action is that of a respiratory stimulant. The best results are obtained from its subcutaneous injection, but naturally such mode of administration is usually reserved for cases that have reached a critical stage.

Iodide of potassium is often recommended in those forms of heart disease that are associated with arterial disease. That the drug exerts a beneficial influence on the latter process in its earlier stages is doubtful, while in the later stages no evidence of improvement is usually forthcoming after its administration. It tends to lower arterial tension, however, and in this way its use may be to some extent beneficial, and it may be regarded as an expectorant when much viscid secretion is present in the bronchial tubes. In a case of muscle failure of the heart in a syphilized subject, the cause of which is not obvious, it might be prudent to employ the drug, with or without mercury, for a time, in view of the possible presence of a gumma in the myocardium. The removal of neoplasm is all that can be expected.

It is impossible to regard cardiac muscle failure as a definite clinical entity: its causes are too numerous and different, while it is they that determine the line of treatment. The chlorotic girl, and the middle-aged man with gout and granular kidneys, may equally be the subjects of cardiac muscle failure—the one curable, the other not, though

susceptible to judicious therapeutics. In like fashion, the young rheumatic subject of myocarditis, and the old man whose progressive cardiac failure is wrought by his arteries alike increasing the burden of the heart and crippling its nutritive supply, furnish a striking contrast, though both are well-nigh equally hopeless. Between such extremes there is a vast number of cases of cardiac muscle failure that offer a fruitful field for therapeutic effort. Their treatment, however, must not be limited to drugs, but must include diet, rest, the regulation of exercise, and the freeing of the mind from worry as far as possible.

In chlorosis, rest in bed, iron, and a plentiful supply of red meat, usually speedily cure, without recourse to digitalis, strophanthus, or like drugs. In some cases, massage proves a valuable adjuvant. *Graham Steell.*

MYXŒDEMA.—In carrying out the treatment of a case of myxœdema we have to make good the loss of function of the thyroid gland by supplying the secretion from another source. This can be readily obtained from the thyroid gland of an animal, such as the sheep. Normally the secretion is continually being carried into the blood-stream. We cannot exactly imitate this, but it is found in practice that, if the supply is given in a single daily dose, the results are quite satisfactory. The thyroid secretion may be administered by the mouth in several different forms. The actual gland itself may be given, and though, as a rule, this is not so convenient as one of the preparations of the gland, it may be useful when the patient lives in some remote place. The fresh gland can be readily obtained wherever sheep, oxen, or pigs are killed. If the raw gland is used, from one-eighth to one-quarter of the lobe of a sheep's gland is an average daily dose for an adult, one-fifth of a lobe being equivalent to 10 min. of liquor thyroidei. The raw gland may be lightly fried on the outside, or it may be minced and taken in some sweet vehicle, such as a syrup, to make it palatable. As a rule, it will be found more convenient to employ either liquor thyroidei (B.P. 1898) or thyroideum siccum (B.P.). The former is the original thyroid extract, which I first introduced in 1891, and the latter is a powder obtained by drying the minced glands at 90°–100° F. One grain of the powder should be equivalent to about 5 min. of the liquor, but in actual practice one grain of dried thyroid is only equal in efficiency to about 2 min. of the liquor. Of the two preparations the best results are obtained in the treatment of myxœdema by the use of the liquid extract, though the dry powder is more convenient, as it can be readily made up into compressed tablets.

In dealing with an advanced case of myxœdema, which is now rarely seen, the patient should be confined to bed during the first part of the treatment, so as to avoid any over-exertion. This is important, as these patients are apt to have some fatty or fibrous degeneration of the myocardium, and any increased exertion may induce an attack of syncope, which has proved fatal in several cases. Only small doses of thyroid should be given at first, 2 to 3 min. of the liquor or 1 gr. of the dry thyroid, at bedtime. This dose may be gradually increased up to 5, 7, and finally 10 min., or to one 5-gr. tablet, during the course of two or three weeks, when the patient may be allowed to get up again. Exercise must be strictly regulated, and increased only by degrees, according to the condition of the pulse. Any increase of the pulse-rate beyond 80 or 90, when the patient is at rest, is an indication that the dose should be reduced.

In early cases in which no cardiovascular changes can be detected, this period of rest is not necessary, though patients should be warned against undertaking any unusual exertion during the first stage of the treatment. In these cases 5 min. of thyroid extract or one 2½-gr. tablet may be given each night, and the dose gradually increased up to 7, 10, or 15 min. according to the progress made. As soon as the first stage of the treatment is completed—that is to say, as soon as the symptoms of the disease have disappeared—a somewhat smaller quantity will probably suffice for the permanent dose. It is most important to make patients clearly understand the nature of the treatment, and the necessity for its steady continuance during the rest of life, in order to avoid a return of the symptoms of myxœdema. This is easily done in the case of educated people, who can readily understand the rationale of the treatment and the necessity for taking the thyroid extract regularly, as part of a daily diet. Some hospital out-patients, on the other hand, are inclined to neglect the treatment as soon as the symptoms have disappeared, and of course they sooner or later return as before. As a rule, 10 min. of

the extract, or one 5-gr. tablet, each day is quite sufficient. Thus the first case of myxœdema in which I began the treatment, in 1891, took regularly 10 min. each week-night, that is, 1 drachm of thyroid extract each week. She remained well and free from any symptoms of the malady until 1919, when she died from cardiac failure at the age of 74. In some cases a daily dose of 5 or 6 min. is sufficient; in a few, 15 or even 20 min. a day may be required. During hot weather, or an acute illness with fever, it is advisable to reduce the usual dose for the time being. The liquid extract should be obtained fresh each fortnight.

During the first stage of the treatment, the solid œdema steadily diminishes, the skin gradually becomes less dry, and perspiration returns. The temperature rises to the normal level, so that the patient no longer complains of feeling cold. The normal mental and bodily activity is gradually regained, and the speech becomes natural. At a later stage, the hair grows again; in fact, the patient recovers, and remains free from the symptoms of the disease as long as a sufficient daily dose of the thyroid extract is regularly taken.

George R. Murray.

NÆVUS.—(*See* ANGEIOMATA.)

NAILS, DISEASES OF.

Eczema.—Treatment of this condition is always tedious, as it is difficult to get at the matrix. The ends of the fingers should be wrapped up in an ointment of salicylic acid, ½ drachm to the ounce, the ointment being pushed as far as possible under the nail fold. Oleate of tin, 1 drachm to the ounce, is also used in an ointment.

Ingrowing Toe-nail is treated of elsewhere (*vide* TOE-NAIL, INGROWING).

Psoriasis.—Arsenic internally is indicated. The thickened nail must be scraped down by a piece of glass, and an ointment of salicylic acid, ½ to 1 drachm to the ounce, applied.

Chronic Hypertrophy (Onychauxis) is treated like psoriasis of the nail.

Onychogryphosis.—After thorough soaking in hot water to soften it, the superficial part of the nail is removed. In very neglected cases a fine saw may be required.

Onychia.—(*See also* WHITLOW.) Inflammation of the nail may be due to coccal infection, to syphilis, and to tuberculosis. In the coccal form, fomentations with boric acid may be sufficient in mild cases, but where the affection is severe, and there is tension, the nail may require removal under anæsthesia, and fomentations and antiseptic ointments are applied subsequently.

In the syphilitic forms, internal treatment is most important. Neosalvarsan injections and mercury in the secondary, and the same remedies with the addition of iodides in the tertiary, forms will be required. As local applications, black wash and the yellow oxide of mercury ointment are useful. The diseased nail may require removal.

In the tuberculous form, removal of the infected part, and possibly of the terminal phalanx, may be required.

Ringworm.—Both the endo- and ectothrix varieties of the tricophytons may affect the nails, the former being the more common parasite. The nail should be well scraped and the following solutions, suggested by Harrison (of Bristol), used. For fifteen minutes the nail is soaked in a lotion consisting of equal parts of liquor potassæ and water with ½ drachm of potassium iodide to the ounce. The lotion is covered by oiled silk to prevent evaporation. At the end of the fifteen minutes a sublimate lotion is applied and left on for twenty-four hours. The sublimate lotion contains 4 gr. hydrarg. perchlor. to an ounce of a mixture of equal parts of rectified spirit and distilled water. At the end of the twenty-four hours the nail is scraped again and the same procedure carried out. This is repeated until the scrapings show no evidence of the fungus. Sabouraud advises keeping the affected nails soaked in a weak iodine (5 per cent) solution under rubber finger-stalls. Norman Walker's method is also of service. The affected nail is soaked for one or two days in Fehling's solution under lint and a finger-stall. The softened nail is then removed, and the base dressed with a solution of copper sulphate 10 gr. to the ounce. In bad cases the affected nail may be removed under anæsthesia and the antiseptics named be applied to the exposed surface. The treatment of **Favus** of the nails is similar.

The alterations in the nails which occur in **Debilitating Illnesses** demand no special treatment. As a rule they pass away on the improvement of the general condition, though somewhat slowly owing to the slow growth of the nails.

James H. Sequeira.

NASAL CATARRH.—(*See* RHINITIS.)

NEPHRITIS, ACUTE.

The leading principles in the treatment of renal disease may be summarized as follows: (1) To diminish the work of the kidney as much as possible, and this includes diminishing not only the excretion of nitrogenous extractives, but also the other excretory activities of the organ, e.g., salts and water; (2) To promote, as far as may be, excretion by other channels; (3) The treatment of such associated conditions as dropsy and uræmia; (4) To check, so far as possible, the disordered metabolism.

The necessity for restricting, as far as possible, the excretory activity of the kidney, is greater in acute than in most cases of chronic renal disease, since the activity of the organ is usually more impaired in acute than in chronic affections. There are exceptions to this, namely, where an acute exacerbation or complication occurs superadded to a chronic lesion, and in the terminal stages of fatal chronic cases.

In acute renal disease it is possible to restrict the output of nitrogenous extractives, salts, and water, etc., to a greater degree than in chronic cases, owing to the transitory character of the affection. In chronic diseases, undue restriction of the ingesta may produce injurious effects by lowering the general health, and it may not be advantageous to attempt to produce an improvement in the urinary excretion at the cost of still further impairment of the general nutrition. In acute renal disease the indications are clear, to restrict as far as possible the work the kidneys have to perform.

Food.—The food given in acute renal affections must be not only small in amount, but also of the simplest character, and readily digestible, owing to the frequent occurrence of gastric disturbance, and the accompanying nausea and vomiting.

All food rich in nitrogenous extractives is obviously contra-indicated, such as soups, broths, meat essences, as such articles of diet not only increase the work of the kidney, owing to their richness in nitrogenous extractives and saline ingredients, but also are of small nutritive value. Solid food is also inadmissible, owing to the gastric disturbance. Thus the diet is practically limited, if food be given at all, to milk. Three pints of milk per diem are usually looked upon as the minimum quantity necessary to maintain the nutrition of the body in an approximately normal condition, as this quantity will supply 60 to 70 grm. of protein, usually regarded as the minimum necessary. In actual renal diseases lasting but a short time, probably no harm will result from diminishing the input to a still greater extent, and a pint to a pint and a half per diem is probably sufficient, at any rate for some days.

In cases where the acute nephritis is of a very severe type, leading, it may be, to practical suppression of urine, it is advisable to cut off all food, and simply to allow the patient to sip water. A few days' starvation will not produce any disastrous effects on the body generally, and it may turn the scale in favour of the patient by still further diminishing the work of the kidney. Even in starvation, considerable quantities of nitrogen in the form of urea, etc., are excreted in the urine, especially during the first few days, so that even by starvation it is impossible to afford the kidney complete rest; but there is much to be said in favour of allowing only water in moderate quantities for two or three days in the treatment of severe cases of acute nephritis. In the majority of cases, however, the type of the disease is not so severe, and milk as mentioned above, in quantities of from one to one and a half pints per diem, may be allowed. After the lapse of a few days, the condition of the urine will probably improve, the amount of blood diminishing and the quantity of urine increasing, and further quantities of milk may be given, and some carbohydrate in the form of bread, arrowroot, etc., may be added. Great care should be taken not to increase the diet too rapidly, and to be guided mainly by the condition of the urine, trusting to make good the patient's condition subsequently, when the acute renal lesion has subsided.

Where the kidney lesion is less severe, and gastric symptoms are not marked, there is no objection to increasing the food by the addition of more carbohydrates and fats in the form of cream; but the quantity of protein food should be restricted as much as possible, and care taken not to give fluids in large amount. Where gastric symptoms are marked, it is advisable to pancreatize or artificially digest the milk, and usually a mixture of equal parts of gruel and milk makes a more suitable food for artificial digestion

than milk only. Such a mixture is much more palatable, and its nutritive value is greater, than if the same quantity of milk be simply diluted.

There is considerable difference of opinion with reference to the quantity of fluid that should be allowed to patients suffering from acute renal affections. Some writers advocate the free administration of water, with the idea of its elimination by the kidney leading to the washing out of the débris in the form of shed epithelium that is choking the renal tubules. Others consider that the administration of large quantities of water in acute nephritis is liable to be followed by the production of hydræmic plethora, owing to the diminished and imperfect elimination of water by the kidneys, and they regard this plethora, if not as the actual cause, at any rate as a powerful predisposing cause, in the production of dropsy. It is probable that an indication as to the free use of water may be afforded by the state of the patient. If the acute renal affection is one where only urinary changes are present and dropsy is absent, water as a diuretic is probably useful. On the other hand, in the acute lesions where dropsy is a marked sign, fluids should certainly not be given freely, although it must be remembered that it is impossible to treat dropsy by the mere restriction of the input of water: such restriction leads only to great distress, and produces no beneficial results. No good results can follow the administration of large quantities of water in such patients, with the idea of flushing out the kidneys. The indiscriminate giving of fluids in large quantity may not only perhaps aid the development of dropsy, but the hydræmic plethora is also liable to be accompanied by cardiac dilatation, which is one of the most serious complications of acute renal disease. Observations of the weight of the patient afford an accurate and valuable index as to whether the fluid ingested is causing hydræmic plethora or not, and also indicate whether the dropsy is increasing or not.

Thirst should be treated, not so much by the giving of water, as by measures directed to promote the flow of saliva. Lemonade, and fruit juice of various kinds, are advisable for this purpose.

Measures directed to promote the excretion of fluids and salts by other channels than the kidney are of the utmost importance in the treatment of acute renal disease, and such excretion must take place by means either of the bowel or of the skin. Treatment of this kind is not only necessary for the relief of dropsy, and of uræmic symptoms when these are well marked, but it is also advisable in all instances where the excretory activity of the kidney is diminished, even if marked uræmic symptoms are absent.

In normal circumstances the activity of the skin is correlated with that of the kidney, at any rate in so far as concerns the excretion of water; but in renal disease, both acute and chronic, but especially the latter, it is often difficult to promote the secretion of sweat, the skin being unnaturally dry.

The intestinal mucous membrane may not only serve as the channel for the elimination of large quantities of fluid, but, in conditions where the activity of the kidney is impaired, the fluid secreted by the bowel contains appreciable quantities of urea and other nitrogenous extractives, and quite considerable amounts of urea may be excreted even from the stomach in renal diseases. Measures directed to increase the loss of fluid by the bowel will therefore also remove from the blood considerable quantities of the normal constituents of the urine. Purgation is also useful, as it necessarily procures immediate relief of the hydræmic plethora so often present. The only contra-indication to free purgation in renal disease is the fact that enteritis may occur as a complication; and in some instances, but especially in chronic renal affections, this enteritis may be of an ulcerative type, and affect the lower bowel. The purgatives selected should be those tending to produce copious watery motions without causing much griping, and saline purges are especially useful for this purpose. They should be given in a concentrated form, as it is desirable to produce a hydragogue effect. Sulphate of magnesia, sulphate of soda, phosphate of soda, acid tartrate of potash, are all useful. Sulphate of magnesia and sulphate of soda have the advantage of being more soluble than the others, and consequently it is easier to give them in a concentrated form, and thus a greater hydragogue effect is produced than with the use of phosphate of soda or acid tartrate of potash. Sulphate of magnesia has one drawback, that it has a considerable depressant action on the heart, far greater than that produced by any other saline cathartic. This objection is perhaps more of theoretical than of practical importance, the amount of sulphate of

magnesia absorbed being probably very small. The saline purges should be administered in small doses at frequent intervals, rather than in large doses at longer intervals, and very good results are seen by giving the drug in a drachm dose every hour, or every two hours, until the desired effect has been produced. Although saline cathartics are especially indicated in the treatment of renal disease, other purgatives having a hydragogue action are also useful, jalap being especially recommended for this class of case. Elaterium is occasionally used, but its action is liable to be unpleasantly violent at times, and its use is really more or less restricted to cases where marked uræmic symptoms are present, and where it is essential to produce a prompt evacuation of the bowels.

In some cases, purgatives are required to produce simply a free evacuation of the bowels rather than a marked hydragogue effect, and in such instances the traditional mercurial purge, in the form either of blue pill or a small dose of calomel followed by a saline draught, is the most efficacious. Some writers have objected to the use of mercury as a purge in almost all forms of renal disease, owing to the fact that in large doses it produces necrosis of the renal epithelium. Even if this objection were a valid argument against the use of mercury in routine fashion in cases of renal disease, it can scarcely be urged against the occasional use of the drug as a purgative. Although in large doses it does produce a coagulative necrosis of the renal epithelium, yet in small doses it is a very useful stimulant diuretic.

Sweating may be brought about either by the use of drugs or by hot baths. The promotion of sweating by the application of heat in moderation cannot but be beneficial, and for this purpose the hot pack may be used with advantage. Hot-air baths may also be useful, provided they are not employed at such a temperature as to cause syncope, or tendency to syncope, since many patients are very intolerant of the more extreme temperatures often employed in hot-air baths. Such a bath at a moderate temperature, 120°–140°, can do nothing but good if it causes sweating, but, as already mentioned, the skin in renal disease is often unnaturally dry and harsh, and sweating cannot be produced even by the application of much higher temperatures. Great care should always be taken that the first hot-air baths given are at a comparatively low temperature, and the temperature should be gradually raised ; the patient should be watched all the time, to see if any feeling of faintness or acute discomfort is produced. Sweating may often be promoted by the giving of hot drinks during the bath or by the administration of small doses of drugs : acetate of ammonia, nitrous ether, or even pilocarpine. The use of hot-air baths at high temperatures, above 170°, is not altogether free from risk. Many instances of sudden death in the bath, in patients suffering from renal disease, might be quoted. It is true most of these occur where the hot-air baths are used for the treatment of uræmia in chronic renal disease, but cardiac dilatation is not very uncommon, accompanied with much circulatory weakness, in acute renal disease. It is doubtful whether much good is to be derived from persisting in hot-air baths in cases where the skin does not readily respond to such treatment.

Sweating can also be brought about by medicinal agents, but it is difficult to cause profuse sweating by this means without the occurrence of other, more or less undesirable, effects. Thus pilocarpine in full doses will produce very free sweating, but at the same time it may cause a considerable degree of bronchorrhœa and so lead to marked respiratory embarrassment. Further, pilocarpine in full doses has a very marked action on the heart, and the profuse salivation and lachrymation, although not serious, are often very distressing. The bronchorrhœa is especially serious in waterlogged patients, and pilocarpine should be given in small doses in association with hot-air baths. There is no objection to the promotion of sweating by the administration of acetate of ammonia and nitrous ether, and hot drinks.

In acute renal disease of a severe type, where the urinary functions are not only seriously hampered but may be suppressed, great benefit may be obtained from venesection. The circulation generally, and in the kidney, may be relieved by this means, and the amount of toxic material in the blood diminished. The blood is usually drawn from a superficial vein of the arm or neck, but, according to some, it is desirable to bleed from the dorsal vein of the foot, with the idea that the circulation through the kidney is more directly relieved by such a procedure, and bleeding from the dorsal vein of the foot has been specially recommended in cases of acute hæmorrhagic nephritis, with more or

less suppression of urine. In some instances of extreme congestion of the kidney, incision of the renal capsule itself has been recommended and carried out, with the idea of relieving the extreme congestion that is sometimes present, and very beneficial results have been claimed in such cases from this procedure.

Transfusion of saline solution is also useful in association with venesection, and is more especially indicated in cases where uræmic symptoms are marked ; but transfusion, or even the subcutaneous injection, of salt solution is of material service where complete or partial suppression of urine without uræmia is present. In many cases where complete suppression occurs, either in acute nephritis or in other forms of renal disease such as calculous obstruction and occlusion of the renal arteries, uræmic symptoms are frequently in complete abeyance for many days, and it is not uncommon for death to occur in such cases without the development of ordinary uræmia. Transfusion is peculiarly useful in such cases, and by its aid life may not only be prolonged, but may also be saved in some conditions, e.g., calculous anuria, thanks to the patient being tided over a critical period. The transfusion would seem to dilute the blood, and thus prevent the development of serious toxic symptoms ; and elimination may be promoted through the bowels, and the acute congestion, or other renal lesion causing the symptoms, may subside. In calculous anuria this method of treatment may enable the patient to tide over the time necessary for successful surgical interference.

In the convalescence from acute nephritis, the treatment must be directed with the aim of preventing, as far as is possible, any recurrence of the renal lesion. With this object all possible exposure to damp and cold should be avoided, and it is in this class of case that residence in an equable climate during the winter is especially desirable. The South of England (e.g., Cornwall), Aix-les-Bains, Madeira, the Canaries, Egypt, are especially suitable for such patients. Their diet should be an ordinary plain, unstimulating one ; but there is no necessity to avoid meat completely, and there would not seem to be any real advantage in recommending white meat, as is so frequently done. Such patients are commonly anæmic, and their general nutrition and power of resistance to disease have often been considerably affected by the acute malady ; thus they require plenty of good plain food in order to regain health. Although a moderate diet is necessary with such patients, alcohol is probably inadvisable. Careful attention should be paid to the bowels, and a course of saline purges is frequently beneficial. Tonics, in the form of iron and arsenic, are useful, and the iron should be administered freely, but in a form that does not lead to gastric disturbance ; for this reason the perchloride, although a powerful tonic, is very often unsuitable, and better results are obtained with the sulphate of iron, given as a pill. Some of the milder preparations, such as the citrate and tartrate, may also be employed, especially in the case of children, and some authorities think that the administration of small doses of iodide of potassium with the tartrate of iron is more beneficial than giving the iron by itself. Arsenic in small doses is also extremely useful in the treatment of the anæmia and debility following acute nephritis. Any preparation of arsenic, however, should not be administered for prolonged periods, as even small doses not infrequently cause toxic effects ; it is advisable to order the drug for periods of ten days or a fortnight, to be followed by an intermission of a week. Renal extracts, prepared in a variety of ways, have been recommended by some writers in the treatment of acute renal disease ; these extracts are usually prepared from the kidney of the pig, and have been administered either in the form of glycerin extracts, or as broths or infusions of the macerated fresh kidney. There is a general consensus of opinion that the broths are useless, and that no results of any value are obtained from organs that have been heated or cooked. There is much difference of opinion, both from the experimental and from the clinical side, with regard to the efficacy of the fresh extracts ; the watery extract prepared from the macerated fresh kidneys has been stated to be of value, in the treatment of both acute and chronic renal disease, especially where uræmic symptoms are present. The fresh infusion is extremely nauseous, and very repugnant to the patient both in appearance and taste, and not uncommonly leads to gastric disturbance and to cutaneous eruptions. Notwithstanding these obvious drawbacks, such extracts, given by the mouth, have been stated to produce beneficial results in cases where the secretion of urine was very scanty and the uræmic phenomena were marked. The subcutaneous injection of such extracts into animals produces very marked toxic effects, and later experiments would seem to

have led to different results from those obtained at first. Brown-Séquard and others stated that the use of such extracts led to the prolongation of life in animals after double nephrectomy; but more recent results would seem to show that this is not so, and that the use of such extracts after experimental double nephrectomy in animals really tends to shorten rather than to prolong life, and that the supposed benefits at one time obtained were simply due to the fluid of the injection, inasmuch as better results follow the use of copious saline injections than the use of renal extracts. In the present state of knowledge it cannot be said that there is any clear and definite evidence in favour of the use of renal extracts in the treatment of renal disease, and the same remark applies to the use of blood-serum derived from the renal vein, which at one time was thought to possess marked beneficial properties.

John Rose Bradford.

NEPHRITIS, CHRONIC.—The two most important forms of chronic Bright's disease are (I) *Chronic parenchymatous nephritis*, or the later stages of acute nephritis; and (II) *Granular kidney*. These two affections stand in marked contrast clinically and pathologically to one another, and in respect of treatment must be dealt with separately.

I.—CHRONIC PARENCHYMATOUS NEPHRITIS.

In chronic parenchymatous inflammation we have to do generally not with a slowly progressing, i.e., still active, inflammatory process, but with the result of an inflammation previously acute but not any longer active.

As the two stages pass gradually into one another, and it is impossible to say exactly where the acute stage ends and the chronic begins, so the treatment of acute nephritis gradually merges into that of chronic, and the question arises when and in what way the treatment of the acute stage may be modified, its restrictions relaxed, and the treatment of convalescence commenced.

In acute nephritis the circulation in the kidney is disordered, the cells are disorganized, and the tubules obstructed by disintegrated cells and exudation.

The treatment at this stage is to relieve the kidney of work by modifying the diet, keeping the skin and bowels active, and avoiding all renal irritation.

In the later so-called chronic or post-nephritic stage, the circulation has more or less recovered itself except for the hyperæmia necessary for active cell-growth. The obstruction to the tubules is relieved, and new cells are actively growing to take the place of those which the inflammation has rendered useless. Thus cell-growth is the chief phenomenon of convalescence. For healthy cell-growth the body must be in a good state of nutrition, and the delicate young cells formed must be nursed and protected until they are seasoned and robust.

The problems, then, of treatment in chronic parenchymatous nephritis are to promote the growth of healthy cells, to avoid fresh irritation, and to lighten the work which the weak and delicate organ has to do.

The first important question in the treatment is that of **Diet.** When and in what way may that be improved? Patients are often kept upon a milk diet as long as albumin is present in the urine. Milk is good enough for little children, and in acute disease adults have to be treated like little children. Yet for both alike the time comes when the diet must be strengthened, for, if restricted to milk alone, the nutrition suffers, the tissues become flabby and soft, and the patient anæmic. Life may, it is true, be maintained for a long time on milk alone, especially when supplemented by starchy foods, but the body is not vigorous and the general tone is poor. Fortunately, adults get so tired of milk alone that they often take the matter into their own hands and modify the diet for themselves. The benefit of change of diet in chronic parenchymatous nephritis is a matter of daily experience. The patient's condition often remains stationary till a more liberal diet is given, and then improvement begins at once.

The effect of change in diet is to be judged by the general condition and feelings of the patient, and not by variations in the amount of albumin. Weight is obviously no guide, for patients who are losing their œdema would be losing weight, though getting better.

There are certain articles of diet which should be avoided in all cases of kidney disease: *alcohol* in all forms; *meat extracts*, whether in the form of soups or broths, or of the much-advertised and popular extracts of meat; fruits and vegetables which are rich in irritating salts, e.g., tomatoes, asparagus, gooseberries, etc.; and for a similar reason salted, dried, and preserved meats. *Salt* should be avoided as far as possible, and if there is much dropsy a salt-free diet is advantageous. A diet composed of eggs, milk, boiled fish and chicken, butter, fruit and biscuits, or bread baked without salt, meets this indication.

Why *eggs* are taboo I cannot understand, for they yield a very easily assimilated form of albumin and form an excellent supplement to milk. Nor can I see any reason for the prejudice which exists against *red as distinguished from white meats*, unless it be that some patients may find the one more easy of digestion than the other. Red meats contain no more extractives than white. In both cases, boiled meats are better to begin with than roast, as in boiling some of the extractives are dissolved away. The patients often crave for a little red meat, and I do not know any good reason for refusing their wish.

Fish, though rich in nitrogenous extractives, is a good article of diet, as it is light and easily digested.

The order of change of diet might be tabulated somewhat after this fashion :—

1. Milk.
2. Milk, with farinaceous foods.
3. Milk, farinaceous foods, with an egg or two and some cream.
4. Milk, farinaceous foods, an egg with beans, peas, potatoes, or green vegetables.
5. The previous diet, with the addition of fish.
6. Boiled meats (white or red), fresh pork, etc.
7. White or red meats, roast or boiled.

The effect of any change of diet may be judged from the urine, but a single examination on the day after the change must not be regarded as conclusive, for any sudden change in diet is associated with a general disturbance of chemical equilibrium, which would betray itself in the urine for a few days, until equilibrium re-established itself. Thus, the addition of a single egg may lead to the sudden increase of the percentage of urea in the urine from 1·5 to 3·5, though in three or four days the percentage gradually returns to the normal 1·5, in spite of the offending egg being continued all the time. Still less can albumin be taken as the test, for even if the amount should be temporarily increased by the change, the improvement in the patient's condition occurs and is maintained ; but as a matter of fact the change of diet is often unaccompanied by any alteration whatever in the amount of albumin passed.

In recent times good results have been obtained in some cases, especially if there is much dropsy, by the adoption of *Epstein's diet*. It is a diet rich in protein and poor in fat, and may consist of fish, lean meat, lean ham, white of egg, oysters, lentils, peas, rice, oatmeal, bananas, skimmed milk, coffee, tea, and cocoa. The fluids should amount to one and a half to two pints daily, and enough salt is allowed to render the food palatable.

The next practical question that arises is, **When may the patient leave bed** and get about ? The risk is that of catching cold, and every precaution must be taken to avoid this. The difficulty with children is often so great that bed is rightly regarded as the safest place. So it might be with a careless adult, but prolonged confinement to bed affects the health injuriously, though children bear it better than adults.

The change from recumbent to erect position is very likely to be accompanied at first by an increase in the amount of the albumin, which, however, may slowly decrease again as the body accommodates itself to the altered conditions.

Fresh air is a very important factor in the treatment of the convalescent, though in kidney disease it is often not thought of, the patient being confined to one room, which is often kept too warm and not sufficiently ventilated. Even if the patient be in bed, the windows may be opened and as much fresh air as possible given, provided there be no draught. In suitable weather, kidney cases may even be carried in the bed out of doors, and lie all day in the sun. The *open-air cure of nephritis* is as important and advantageous as in many other diseases, provided draught and exposure be avoided.

The **Drugs** useful for the later stages of parenchymatous nephritis are chiefly of the nature of tonics. Among these, *iron* comes first and is the most valuable. The more astringent preparations, such as the perchloride, are the best if they do not disagree. Iron is especially useful when the patients are taking nothing but milk, for on a milk diet not enough iron is provided for the body's needs, and anæmia may develop in consequence. *Digitalis* may be associated with the iron ; in small doses it assists the heart and raises

the vascular tension, which in the convalescent stage is low. It is contra-indicated if the tension be high.

℞	Tincturæ Ferri Perchloridi	℥xv	Spiritus Chloroformi	℥x
	Glycerini	ʒj	Aquæ Destillatæ	q.s. ad ℥j

Ter die, post cibum. Or with Tinctura Digitalis ℥x.

Sulphate of magnesia may be added if the medicine has a constipating effect.

℞	Ferri Sulphatis	gr. ij	Sodii Sulphatis	ʒss
	Magnesii Sulphatis	ʒss	Aquam Destillatam	ad ℥j

To which Pulv. Digitalis gr. j may be added.

℞	Ferri Sulphatis	gr. j	Pulveris Digitalis	gr. j
	Extracti Aloes	gr. j	Pilulæ Saponis	gr. ij

Ft. pilula. Ter die sum.

The Liquor Ferri et Ammonii Acetatis U.S., formerly known as Basham's Mixture, is a useful combination, tonic, diaphoretic, and diuretic, as follows :—

℞	Tincturæ Ferri Perchloridi	℥x	Syrupi Simplicis	ʒss
	Acidi Acetici Diluti	℥xv	Glycerini	ʒss
	Liquoris Ammoniæ Acetatis	ʒij	Aquam Destillatam	ad ℥j
	Syrupi Aurantii	ʒss		

Arsenic is often associated with the iron as a general tonic, but the dose should always be small, as it is an irritant to the kidney. Arsenic is often best avoided, and in no case should its use be continued for long without intermission.

Diuretics are unnecessary, for the amount of the urine is generally already above normal, and diuretics are mainly renal irritants. The most useful is caffeine, because it is a good cardiac stimulant also. A cup of weak, freshly made tea is greatly enjoyed in the quite early days of convalescence, and does good.

Many of the patent and popular remedies are only preparations of caffeine, or of theobromine in different combinations, such as theobromine sodium salicylate.

The administration of drugs with the object of causing the disappearance of the albumin is based upon an incorrect theory, and is much more likely to do harm than good. Thus tannin and other astringents, fuchsin, and similar preparations, have been tried and found wanting. Such will be the case, no doubt, with calcium and its salts. Of course it is important in chronic parenchymatous nephritis to assist the kidneys by keeping the skin and bowels in regular action.

Diaphoretics.—A hot bath should be given two or three times a week, or even every day if not found too weakening ; a diaphoretic mixture may be given at night when the bath is not taken. It is not wise to give this during the day, if the patient be up, on account of the risk of chill, but instead the body may be well rubbed with a hot dry towel before dressing.

Purgatives.—The bowels should be moved freely at least once a day, not merely with the object of keeping the bowel empty and so avoiding absorption of any toxic material, but especially to encourage elimination by the intestine of some of the substances which ordinarily would be removed by the kidneys. Further, free purgation diminishes vascular tension, but in chronic parenchymatous nephritis this action is not indicated as it is in the acute stage or in granular kidney. The best purges are the salines, which may be usefully combined with aloes. Even mercury in small doses may be useful now and then, but should always be followed by a saline purge. The favourite kidney purge for regular use is the compound jalap powder.

Violent purges should be avoided for ordinary use, as they produce griping and intestinal irritation, and may seriously disturb the digestion.

The drug treatment, then, of chronic parenchymatous nephritis is that of convalescence from any severe disease, and needs to be modified only so far as the organ which has been attacked—in this case the kidney—requires.

When convalescence is established, the question arises of going away, or **Change of Air.** During summer, the choice in this country is ample, there being many suitable places inland or on the sea-coast. In winter the selection is more difficult. The object

is to obtain as equable a climate as possible, with the maximum of sunshine and protection from cold winds. The choice will generally fall upon some seaside place on the south-west coast. Many of the places in the west where the Gulf Stream touches the coast are suitable, but unfortunately, though warm, they are often wet.

Abroad there is a choice of climates. Madeira, the Canaries, and the Azores are within easy reach of England. Algiers and Egypt have the advantage of a dry and sunny climate, but the difference between the day and the night temperatures is considerable. The Riviera is unsuitable, on account of its violent changes in temperature. The West Indies can be strongly recommended, and as to climate seem to leave little to be desired. Even when convalescence has been complete, great care should be taken during the next cold season. The following winter should be spent, if possible, in a good climate abroad.

The treatment of chronic parenchymatous nephritis has been considered so far on the assumption that the case is progressing towards recovery. **When the course is in the downward direction,** the treatment must be modified to deal with fresh symptoms as they arise.

Chief among them is increase in dropsy. It is extraordinary how extremely dropsical a patient may be, and yet recovery takes place in time. Ascites must be treated on general principles, and tapped whenever necessary. Any attempt to get rid of it by violent purgatives or diaphoresis will be disastrous; such methods are ineffectual, and will besides produce great depression, the very thing to be avoided.

It should be borne in mind that all the dropsy which occurs in these cases is not renal. Much of it is often cardiac, and may be benefited by treatment directed to the heart rather than the kidney.

The following old-fashioned pill is excellent :—

℞ Pulveris Digitalis	gr. j	Pilulæ Hydrargyri	gr. j
Pulveris Scillæ	gr. j	Extracti Hyoscyami	gr. ij

One twice daily.

If the legs become so much swollen that the skin is greatly distended, they may be tapped. Pricks or incisions of the skin are undesirable, for the running from them is difficult to keep under control, and the insertion of fine or capillary tubes is preferable. These are best inserted at the side of the calf. The greatest care must be exercised to avoid septic infection, for once started an infective inflammation round the puncture may soon reach appalling dimensions. Death even may result, in consequence either of extensive sloughing of the skin, or of a clot forming in a vein and becoming detached. Still, with care and strict antiseptic precautions, great relief may be given by draining. The legs should, after puncture, be wrapped up in plenty of aseptic cotton-wool, through which the indiarubber tubing may pass to a vessel beneath the bed.

The treatment of **Acute Uræmia** will be discussed later. It will be sufficient to say here that the prognosis, though worse than in acute nephritis, is not as bad as in granular kidney. In the last affection it is almost invariably fatal. In acute nephritis many, perhaps 50 per cent, recover, and in chronic parenchymatous nephritis perhaps 20 per cent.

II.—GRANULAR KIDNEY.

As we do not yet know the primary or exciting causes of this disease, **Prophylaxis,** or **Prevention,** is at present beyond our powers.

But some of the **Contributory** or **Aggravating causes** are known, and these can be removed or treated.

Granular kidney is often associated with lead poisoning, chronic alcoholism, gout, syphilis, mental strain, overwork, and worry. Yet it is not so clear that it is actually produced or caused by any of them. For instance, lead, gout, and granular kidney stand in close clinical association, so that lead and gout are often spoken of as if proved causes of granular kidney. Yet the only fact established is their common association. It is equally possible that patients are specially prone to gout or lead poisoning because the kidneys are already granular. So with the other associated conditions. But as they may be, if not exciting, at any rate contributory or aggravating causes, it is clear that they should be treated and, if possible, removed. Thus all exposure to lead should be

avoided and, if necessary, the occupation changed; everything that tends to gout dealt with; syphilis treated; alcoholic habits corrected; and overwork, mental strain, and worry, as far as possible provided against.

We may now turn to the more special questions of treatment.

The objects to be held in view are:—

1. To relieve the damaged organ in every way possible, and to prevent any aggravation of the disease.

2. To guard against the accidents likely to occur. Chief among these are failure of the heart and rupture of vessels.

3. To relieve symptoms as they arise. These symptoms are extremely variable, and the treatment must correspond; but it is often surprising, when the cause upon which these symptoms depend has been recognized—that is to say, when granular kidney has been correctly diagnosed—how much may be done to give relief.

The course of the disease may be divided into three periods: (1) *The early stage*, in which, though the diagnosis is clear, the symptoms are few or none. (2) *The intermediate or middle stage*, in which the symptoms vary in kind and degree. (3) *The late stage*, in which the symptoms are pronounced and may be urgent.

1. The Early Stage.

In the early stage the patient believes himself, and appears, to be in good health, and the disease is revealed by accident—examination for insurance for example, or some other accidental cause which takes the patient to the doctor—albumin is discovered in the urine, and the other signs establish the nature of the case. Then the patient rushes into one of two extremes, either refusing to believe there is anything wrong and that care is necessary, or being greatly alarmed and becoming a renal hypochondriac. The doctor's difficulty is to steer the patient between these two extremes: to alarm him sufficiently to make him careful, without making him unduly nervous.

Patients often resent being condemned as unsound when they believe themselves to be robust. Yet it is to their advantage, if they have a weak organ, to know, so that they may spare it.

Early diagnosis is not difficult, and it is in the early stage that the disease is to be arrested if that be possible, or at any rate retarded, as there is every reason to believe it may be, with care and good management.

Albuminuria is not the disease, but the sign or indication, and it is the difficulty of excluding granular kidney that makes the diagnosis of so-called physiological albuminuria in the young adult so uncertain.

Patients not infrequently come to the physician who have been thoroughly frightened, and, because of the albuminuria and the diagnosis of chronic kidney disease, have been placed upon an extremely strict regimen and made to live an invalid life, with the only result that their health, which was as they thought good, had become impaired, and their life, previously enjoyable, been made a burden. No wonder they regard the discovery of albuminuria as a misfortune. In the early stage of granular kidney such a strict regimen is unnecessary. The removal of the extreme restrictions is followed by improvement in health, and renewed enjoyment of life. The treatment of albuminuria as if it were the disease, and as if its disappearance would cure the disease, is not only theoretically unsound, but mischievous in practice.

At this stage, the patients must live moderate, careful, and temperate lives, be properly clothed, avoid chills and exposure, keep the skin in good action and the bowels regular; must avoid alcohol, especially spirits, eschew dissipation of every kind, and live as much as possible in fresh air and sunlight. Even their recreations need not be seriously restricted, provided they are not such as to lead to risky exposure or fatigue. Bathing in the open, of course, must be absolutely forbidden; also fishing, so far as it involves wading; shooting, except in fine weather; and hard hunting; but riding and all forms of gentle exercise, if chill, exposure, and over-fatigue are avoided, may be allowed and are beneficial. The early stage spreads itself over many years, and the strain of the disease is usually not felt until the age of forty or fifty. Till then, or till other symptoms develop, life, with care and good management, may be active and enjoyable, both in work and play.

During the early stage, then, the general health should be maintained in every way by appropriate dieting, by avoiding exposure, overwork, and worry, and by fresh air and regulated exercise. All this is compatible with an ordinary life, and though medical supervision and care are requisite, this need not be in special institutions or particular places.

The first great indication is to relieve the damaged organs in every way possible by maintaining the action of the skin and bowels.

Clothing.—The body should be properly clothed. The patient should wear flannel next the skin, winter and summer, day and night ; if not flannel and all wool, at any rate merino, or a mixture of wool and cotton, or wool and silk.

The clothing should be varied with the weather. It is a great mistake to be too warmly clad, on account of the perspiration it causes, and the risk of a chill. A flannel band should be worn round the loins, as is the habit in the tropics ; and with women low evening dresses should be prohibited.

It is most important to keep the feet and legs warm, as well as the body. This is often neglected, the body being wrapped up warmly while the feet and legs are kept cold ; yet the legs form in bulk nearly half the body, and more chills are caught, perhaps, through exposure of the feet and legs than of the body.

The socks worn, in summer and winter, should be of wool or thick merino ; the boots substantial, and lined with cork or felt socks. Cold or chilled feet especially should be avoided, and above all things, if the feet get damp, the boots or shoes and socks should at once be changed. These may seem trivial details, but they are really of great importance, and it is astonishing how largely they are neglected.

Avoid Chills.—Everything must be done to avoid chill. Thus, care must be taken not to check the perspiration abruptly when the body has been heated by exercise, or during hot weather ; and great care should be taken against draughts after sitting in warm rooms, especially in the case of women who are lightly clad in evening dress. More chills are acquired, perhaps, in hot weather than in cold, on account of the free action of the skin and the draughts to which people expose themselves without sufficient protection. Many of these precautions will depend upon the climate or season. Abrupt changes of temperature are specially to be avoided, particularly if the air be damp. It is for this reason, and to search after a more equable and drier climate than we have in this country, that patients with kidney disease are so often advised to spend the winter abroad.

Climate.—The best that could be devised would be the one in which there were fewest changes, whether the air were moist or dry. Madeira, the Azores, and the Canary Islands have an equable climate, which is warm but very moist, and often too relaxing, so that the patients do not feel well in it. The Riviera, which has a less relaxing climate, is not altogether suitable, on account of the violent changes of temperature between the sun and shade, and between the morning and evening. The mountain resorts of California have been advocated. Perhaps the dry climates of Egypt and Algiers are the best of all, but even these require care, on account of the difference between the day and night temperatures. In my experience patients who have spent the winter in these last places have benefited most. It must be remembered that, with kidney disease, changes of temperature are felt of which the strong are not sensible, and it is on this account that care is always necessary, and a good climate desirable.

Skin Toilet.—Everything must be done to keep the skin in good condition. For this purpose, baths of every kind are useful, whether hot-water, Turkish, or vapour, provided that no chill be taken after. A hot bath regularly, two or three times every week on going to bed, is advisable. Turkish baths are excellent if not found too lowering, and not taken too frequently.

The permission to take a sponge-bath on rising in the morning must depend, to some extent, upon the patient. It is best, as a general rule, not to allow the bath to be taken quite cold, but with sufficient warm water added to take the chill off. A cold bath should be followed by a condition of reaction in which the skin glows and the whole body feels warm and comfortable ; but if the opposite occur, and the fingers become chill and dead and need an hour or two to recover, it is evident the bath is unsuitable. Many patients who cannot take a cold bath, find benefit from a hot one ; but, as a rule, if a sponge bath does not suit, it is better to be content with a rapid sponging over with tepid water, followed by a rubbing with a rough towel.

Bathing in the open, or even in swimming baths, is on all accounts to be prohibited. It may produce temporary albuminuria even in those who have nothing the matter with the kidneys, and it is fraught with mischief in every case where the kidneys are not sound.

Muscular Exercise.—There is no better way of promoting healthy action of the skin than by muscular exercise, if this can be borne without fatigue. It should be of such a kind and amount as to produce gentle action of the skin rather than violent perspiration. If there has been much sweating, a warm bath and a good rub down afterwards is an excellent procedure.

Diet.—In a protracted disease such as granular kidney, too strict a diet cannot be insisted on, and, in order to maintain the patient in good health, it must be a properly mixed one. Milk, though a very useful diet for children, and for adults when acutely ill, is not a good food for adults for any length of time.

Although it is highly desirable that the amount of nitrogenous food should not be too great, it is possible to err on the other side, and make it too small. It is impossible, also, to prescribe one dietary which will suit everyone ; idiosyncrasy must be considered in every case. The forms of albuminous food most especially to be avoided are the various meat extracts which are so popular. These contain a large amount of extractive substances, which are of little use as food, and have necessarily to be excreted largely by the kidney ; the administration, therefore, of such things gives the kidney more work to do. The albumin is far best supplied in the ordinary form of well-cooked meat, fowl, and fish, but it should be in moderate amount. Meat once a day is sufficient ; of the three ordinary meals, one should be fish, one farinaceous, and only the other meat.

There is no reason why red meat should be forbidden. If digested well, it produces no more irritation to the kidneys than white meat, and does not contain any more extractives. Nor is there any reason why an egg or two should not be taken, either raw or lightly boiled.

Fruit, vegetables, and salads are all good, provided they do not contain too much acid. On this account, tomatoes, gooseberries, and such-like should be avoided.

Even a strictly vegetarian diet has been advocated, but few patients can stand it for more than a short time. Farinaceous foods of every kind are clearly indicated, and milk and cream can be taken in quantities ; for such fattening things tend to counteract the loss of flesh which is one of the tendencies of the disease as it progresses.

As the patients pass an excessive quantity of urine, they are often more or less thirsty, and may be allowed to drink pretty freely of water ; but as a rule excess of fluid is to be avoided. Three pints in the day is ample. A good and popular remedy is a glass of hot water from time to time during the day, to which may be added a little lemon-juice, citric acid, or tartaric acid. Stimulants, as far as possible, should be avoided, and above all, the rich and sweet wines of every kind. Dry sherry, Marsala, or light and sound claret are all admissible, but port, champagne, and the heavier Burgundies should be avoided. On the whole, perhaps, a little well-diluted whisky, taken with the meals, is the most suitable beverage, but if the patient can do entirely without stimulants it is best of all.

The Digestive System.—The digestion should be carefully watched, especially if the patients are on a modified diet. The digestion, stomach and intestinal, is easily disturbed, and when imperfect leads to the production of substances many of which are toxic and very irritating to the kidneys. It is important that the bowels should be kept in regular action every day, and perhaps have a tendency to be somewhat loose. This is best provided for, if necessary, by the use of one of the aperient waters, or of Epsom or Carlsbad salts, taken in the early morning. If stronger aperients are required, the favourite remedies are the compound jalap powder, 20 or 30 gr. in cachet or confection, or pills containing jalap, or a little elaterium. Or,

℞	Tincturæ Jalapæ	ʒij	Syrupi Zingiberis	ʒij
	Extracti Cascaræ Liquidi	ʒj	Aquam Cinnamomi	ad ℥iss
℞	Jalapæ Resinæ	gr. iij	Olei Resinæ Zingiberis	gr. ss
	Pulveris Ipecacuanhæ	gr. ss	Pulverem Saponis	ad gr. v

Fiant pilulæ ij. At bedtime.

℞	Tincturæ Jalapæ	ʒj	Syrupi Zingiberis	ʒj
	Tincturæ Sennæ Co.	ʒj	Aquæ Menthæ Piperitæ	q.s. ad ℥iss
	Potassii Tartratis Acidi	ʒj		

Every morning or every other morning.

A course of purgatives or purgative waters is distinctly to be avoided, for it lowers the tone and reduces the general health too much.

To sum up: The general health should be maintained in every possible way by appropriate dieting, by avoiding exposure, overwork, or worry, and by fresh air and exercise. All this requires medical supervision and care, but not necessarily in special institutions or places; for if patients would only carry out the instructions given, they could often derive as much benefit by treatment at home as at the fashionable baths of this country or abroad, except, of course, so far as climate is concerned. It is because they submit to rules abroad which they will not listen to at home, that it is so desirable, in many cases, to send these patients now and then to foreign places for a course of treatment.

2. The Middle Stage.

At this period, when the heart is markedly hypertrophied, and the arteries are much thickened, the treatment has to be directed, in addition, to guarding against the accidents that are now especially liable to occur. These are chiefly failure of the heart, rupture of vessels, and inflammatory affections of the kidney itself.

A hypertrophied heart has diminished reserves, and therefore is rightly regarded as in a pathological condition: it lacks the margin of power which the healthy heart possesses. Its reserves have been swallowed up in growth, and thus a hypertrophied heart will give way under a strain that would not affect a healthy heart at all. It is therefore especially necessary in this stage to avoid physical or mental strain and fatigue, and to watch the heart very carefully during any intercurrent illness, especially during convalescence.

The Cardiac Treatment is of the usual kind, but it is necessary to be careful with *digitalis*, because of its effect upon vascular tension; for if the tension be already high, digitalis will increase it and throw extra work upon the heart; while if the tension be low, it will raise it, and in this way assist the circulation. It may therefore do harm as well as good. *Citrate of caffeine* is a better drug; it is a mild diuretic as well as a cardiac stimulant.

When the heart once becomes weak, failure is often very rapid, and if the heart be much hypertrophied, how much margin of reserve is left cannot be easily estimated.

The Changes in the Vessels are degenerative in type; the walls become brittle, and are likely to rupture. A man is often said to be as old as his vessels. Certainly the amount of arterial thickening is a good guide to the prospect of life.

Many cases of granular kidney at the age of forty have arteries as thick as those usual at the age of seventy. Consequently, the risk of hæmorrhage is as great as at the latter age, and the same precautions must be adopted in each case. All physical straining, as well as mental fatigue and excitement, must be avoided; but with care and common sense, hæmorrhage may be staved off for a long time.

Hæmorrhage.—Hæmorrhage *into the brain* is dangerous because of its seat rather than of its amount; but hæmorrhage from a surface is risky, because of the loss of blood and of the exhaustion that will follow. Thus, copious *epistaxis* may be the beginning of the end; the patient may never recover from its effects, but die soon after of cardiac or general failure.

The ease with which the vessels may give way is often seen *in the conjunctivæ*, where chemosis may occur spontaneously, or from simple straining as in coughing or defæcation, and also *in the retina*, where the hæmorrhages may be numerous, and sometimes of considerable size, though they may produce little or no defect of vision.

Hæmaturia is not uncommon, and is often misinterpreted. Many cases of granular kidney have been operated on in the belief that there was a calculus or growth in the bladder, yet the only lesion found post mortem—for most of these cases die if operated on—was granular kidney.

In the *hæmophilic condition* which develops in the latest stages, the hæmorrhage, which is rather a general oozing from the mucous surfaces than free bleeding, often yields to opium and digitalis, and especially to ergot and adrenalin. All these complications must be treated on general lines, and little can be done in the way of precaution against

them except by guarding, as far as possible, against worry and mental excitement, violent physical effort, and straining.

The **Vascular Tension** may supply indications for treatment. The tension is normally raised in a granular kidney. It is best that a patient should not have granular kidney; but, having granular kidney, it is better that the tension should be somewhat raised. It is a mistake to attempt to reduce it if only moderate, for granular-kidney patients are not so well when the tension is low. Yet the vascular tension may be too high as well as too low, and should then be treated.

The tension can be easily raised by a richer and more stimulating diet, by stimulants, and by drugs, especially by *digitalis* and *adrenalin*. Where the heart is feeble and the tension low too, the following combination is useful:—

℞	Tincturæ Digitalis	♏v	Spiritus Armoraciæ Co.	ʒj
	Tincturæ Strophanthi	♏ij	Aquam Destillatam	ad ʒj
	Caffeinæ Hydrobromidi	gr. ij		

Three times a day.

Adrenalin may safely be given in much larger doses than are usually prescribed, up to 1 or 2 drachms by the mouth, and half these doses sub cutem.

It is not so easy *to reduce a high tension* without affecting the general health as well. *Nitroglycerin* may be given regularly, and in full doses; *nitrite of amyl* is useful for an emergency, but its action is evanescent. *Nitrite of sodium*, or a mixture of nitrate and nitrite, has more prolonged action.

℞	Sodii Nitritis	gr. ij	Aquæ Destillatæ	q.s. ad ʒss
	Sodii Nitratis	gr. x		

Three times a day.

℞	Potassii Nitritis	gr. ss	Potassii Bicarbonatis	gr. xxv
	Potassii Nitratis	gr. xviij		

To be dissolved in a tumbler of water and taken every morning.

A less immediate but more prolonged effect can be obtained by erythrolnitrate ½ to 1 gr., or mannitol nitrate 1 gr., in chocolate tablets twice daily. The doses of either may be gradually increased.

Iodide of potassium is more suitable for prolonged administration, and may be given in full doses, from 10 to even 20 gr. three times a day; but this is often attended with much depression. *Veratrum viride* has also been employed in doses of 10 to 15 min. of the tincture three or four times a day. It powerfully affects the tension, but at the same time acts as a cardiac depressant. It requires watching and care.

The reduction of tension is most simply attained by diminishing the amount of stimulants, placing the patient upon a bland or somewhat reduced diet, regulating the bowels, and keeping up the action of the skin. For a case of this kind a *course of baths* and *laxative waters*, under proper supervision, is frequently very beneficial.

In Intercurrent Diseases, especially if acute, it is most important to watch the weak spots, especially the heart and the vascular tension. Thus, should a patient with granular kidney be attacked with pneumonia, it would be necessary from the beginning to use stimulants freely, such as alcohol and strychnia, as well as stimulating cardiac drugs like digitalis and especially caffeine. The association of granular kidney with pneumonia is a very serious matter, but if the treatment be directed to the weak spots it is often successful.

Surgical Operations.—In cases where surgical operations have to be performed upon patients with granular kidney, a good deal of caution is necessary. The patients require to be carefully prepared, and got into as good a condition of health as possible before operation; but if this be done, an anæsthetic may be safely given, and the operation satisfactorily performed. A great deal depends in these cases upon choosing the proper time, but now that operations are attended with so much less risk than formerly, the importance of properly preparing the patient is often forgotten, and thus risks are incurred which might be avoided. On the other hand, with proper care and preparation, operations may now be safely performed in chronic renal cases to which, not long ago, the renal disease would have been considered a fatal objection.

3. The Late Stage.

Chronic Uræmia—Chronic Renal Toxæmia.

In the third or latest stage the symptoms are pronounced, and are often described as **Chronic Uræmia** or **Chronic Renal Toxæmia.** They are very variable, and may point to almost any part of the body except the kidney as the primary seat of mischief. Symptomatic treatment is often unsatisfactory and unsuccessful, until the cause, i.e., the renal condition, is recognized and treated.

Yet, when the correct diagnosis is made, and the relation of the symptoms to granular kidney recognized, the adoption of appropriate renal treatment in addition to the general measures indicated, is likely to be, and as a matter of fact is in many cases, followed by very beneficial results.

In the later stages of granular kidney the **Arterial Tension** gives many useful indications for treatment. A patient with granular kidney ought to have an arterial tension which is above normal. From this pathological normal the tension may vary by way of excess or defect. The treatment of these extremes has been discussed above.

If it is desirable to **increase the quantity of urine,** *caffeine*, or *theobromine* and its combinations, such as *theobromine sodium salicylate*, are useful, as having a stimulating effect upon the heart as well as on the kidneys.

℞	Caffeinæ Citratis	gr. v	Tincturæ Cimicifugæ	℥xx
	Tincturæ Cacti Grandiflori	℥v	Aquæ Chloroformi	q.s. ad ℨss

Three times a day.

Of all drugs for chronic renal disease, I think *pilocarpine* the most useful. I cannot understand the prejudice that seems to exist against it in some quarters. I have used it very largely, and have never seen any disadvantage follow its administration; on the contrary, nothing but good. Apart from its general action, many of the symptoms are distinctly controlled by it. Thus headache, and the exhausting restlessness so common in the later stages of the disease, may be relieved by pilocarpine more immediately and persistently than by any other means, and even threatened uræmia staved off. I consider it the most useful renal remedy of all. I generally give it by the mouth two or three times a day in a dose of $\frac{1}{6}$ gr. of the nitrate; sub cutem $\frac{1}{12}$ gr. is enough to begin with. This produces nothing more than a gentle action of the skin. The profuse sweating or discharges from other parts of the body, often described, are not produced by such doses, even when repeated two or three times a day, nor have I seen anything like collapse or fainting follow them. Such results may follow the administration of infusion of jaborandi, but they are due to the varying strength of the infusions and to the action of other substances in the infusion besides the pilocarpine.

Restlessness, Sleeplessness, or even **Delirium,** often call for treatment in the later stage of the disease. *Chloral* and *bromide of potassium* are advocated by many writers, but I am not very fond of these remedies, because of their depressing after-effects if persisted with. Chloral, in these cases, often produces rashes, which, however, are of no special import.

All hypnotics which are but slowly eliminated, such as *sulphonal*, *methylsulphonal*, and *barbitone*, are best avoided.

Opium and its preparations may be employed without the risks formerly supposed to attend their use. Indeed, if this drug seems indicated, morphia by the mouth, or sub cutem, may be given without fear, and often with striking benefit, especially at night-time. It is probably safer in granular kidney than in acute nephritis, but it can be given without much risk in either.

As a hypnotic and general sedative in granular kidney, I attach the highest value to *cannabis indica*. This is best given in the form of the tincture, in doses of 15 min. or more at the time of sleep.

℞	Tincturæ Cannabis Indicæ	℥xx–xxx	Aquæ Pimentæ	q.s. ad ℨj
	Spiritus Chloroformi	℥x		

At bedtime.

Chronic Toxæmia.—The *asthenia*, *anæmia*, and *general failure of nutrition*, as well as the many other symptoms which develop in the later stages, are often referred to

chronic toxæmia, i.e., to a condition due to the toxic effects of some substance of which the kidneys ought to get rid but cannot. But they bear so close a clinical resemblance to the conditions which arise from the failure of some internal secretion as to suggest that the kidney also has an internal secretion. Moreover, these symptoms stand in direct relation to the amount of destruction in the kidney. They do not develop until the degeneration of the kidney is far advanced, and they bear a resemblance to the condition which has been produced experimentally by the gradual removal of portions of the kidney in animals.

So far, we have no actual proof that the kidney has an internal secretion, however much inclined we may be by other considerations to believe that such is the case. But the connection between the thyroid gland and myxœdema was not conclusively established until it was shown that the administration of the gland substance cured the disease. The relation between disease of the suprarenal gland and Addison's disease is clinically established, though so far the administration of the gland or its derivative adrenalin has not cured the condition.

There is the same sort of relation established between the symptoms of granular kidney and the wasting of the kidney. The problem is to determine by clinical observation whether the administration of *renal extract* can be shown to be beneficial in renal disease.

There is a difficulty unfortunately in preparing a reliable renal extract. I have tried various methods, and for a time used a glycerin extract, but I have not succeeded in finding any preparation which is stable and can be preserved. I have consequently fallen back on an extract of kidney freshly prepared as required, using by preference the kidney of the pig as being a mixed feeder, rather than the kidney of a vegetable feeder like the sheep.

The great difficulty in obtaining evidence in favour of the usefulness of kidney extract in chronic renal disease lies in the fact that its use must be continued for some time before definite results can be expected ; generally patience is exhausted before the time required, and the treatment given up because the signs of improvement are not immediate. In granular kidney the cases usually come under observation late in the disease, when the mischief is so far advanced that much benefit can hardly be looked for. Yet even then I have seen some of the most troublesome symptoms, especially headaches, relieved by this means when they had resisted other treatment.

In earlier cases this treatment has better prospects of success, and my own experience is distinctly encouraging, and such as to justify further trial. *Samuel West.*

(*Revised by R. Hutchison.*)

NERVES, PERIPHERAL, SURGICAL DISEASES AND INJURIES OF.

GENERAL TREATMENT OF NERVE INJURIES.

This consists in keeping up the nutrition of the parts supplied by the affected nerve and maintaining the paralyzed muscles relaxed until conductivity is restored, by nature alone or aided by the surgeon.

Treatment of Nerve Injuries in Wounds.—Primary suture should be carried out whenever possible. Careful examination is essential, especially in wounds in the neighbourhood of the wrist, for here the fact of nerve injury is often overlooked. Exploration of the wound should never be relied on to reveal a nerve injury ; this should be established by examination before operation.

Rigid asepsis is necessary for complete recovery ; in no branch of surgery does suppuration, even in a slight degree, so militate against success. The full recovery of the nerve is hindered, but not necessarily abolished, by suppuration ; it is delayed and incomplete.

After free exposure of the damaged structures, the nerve is identified, the original incision being enlarged if necessary. If the nerve be found completely divided, no preliminary treatment of the ends is necessary unless they are lacerated. If this be the case they must be trimmed *with a sharp scalpel* ; scissors should never be used for the purpose. The suture should be passed with a round needle through the substance of the nerve, and tied with sufficient tightness to bring the ends in apposition without causing strangulation of the tissue. One suture is, as a rule, sufficient. Care should be taken to avoid longi-

tudinal rotation of the ends of the nerve. It should be our aim to bring the axis cylinders in the peripheral end of the nerve in contact with their own central ends, in order to ensure complete recovery of localization. If it is found that the nerve has been incompletely divided—and it is usually impossible to ascertain this immediately after the accident, apart from exploration—the gap should be carefully trimmed, if necessary, and closed by a suture inserted with a curved needle. Catgut should be used as suture material in all nerve cases; if any strain is likely to be thrown on the stitch, catgut hardened so as to resist absorption is advisable.

It occasionally happens that the nerve is divided at two or more levels, a portion of it being loose; this should be sutured in. At other times it is found that a portion of the nerve is destroyed, so that a gap is left that cannot be bridged over; for the treatment of this complication the reader is referred to the section below on secondary suture.

In all accidentally inflicted wounds of this nature it is advisable to insert a drainage tube; this can usually be removed in twenty-four hours. The limb, with the joint or joints over which the nerve passes, must be put up in such a position as will avoid tension on the suture and overstretching of the paralyzed muscles.

Secondary Suture.—This procedure should become more and more rare. It may be unavoidable in cases of subcutaneous injuries, but where a nerve has been divided in an open wound, treatment should be adopted at the time.

It is necessary first to consider how long after the division of a nerve secondary suture can be carried out with any hope of success. Up to three years from the time of injury, the interval which has elapsed is of no moment. Cases of suture at more remote periods have been recorded, but in no case are the reports satisfactory. This applies especially to the motor side, for it is uncommon to find a patient seeking operation for sensory recovery only. But it may occasionally happen, for example after division of the sciatic, that the patient develops perforating ulcers; it is then worth operating in order to prevent their further formation, even although no muscular recovery is expected.

Before operation, careful examination should be made to ascertain the electrical excitability of the affected muscles; the prognosis will to a certain extent depend on the result of this. The condition of the opponent muscles and of the ligaments of the joints of the affected part must be ascertained. To take a common example: after division of the ulnar nerve, if the fingers are in the ulnar position, with contraction of the flexor and extensor muscles and palmar ligaments, it is extremely unlikely that the hand will ever regain its normal condition, although the function of the affected muscles may be restored. I have pointed out that the prognosis depends to a great extent upon the manner in which the original wound healed. Suppuration in the wound makes the chance of recovery doubtful. A complete examination is therefore necessary before expressing any opinion as to what can be expected from the operation.

The operation may be divided into stages: (1) Identification of the ends of the nerve; (2) Freeing them; (3) Uniting them. The incision should be made over the line of the nerve, and must be of sufficient length. The nerve should be found above and below the seat of injury, and traced into the mass of fibrous tissue with which the ends are usually incorporated. After freeing, the greater part of the bulb on the central end should be removed, in order to obtain normally coursing nerve fibres. From the distal end only the fibrous upper extremity need be removed; the whole of the lower end of the nerve will be found in the same condition, so that it is useless cutting section after section in the hope of reaching a portion which looks less like fibrous tissue and more like nerve.

The ends of the nerve should never be trimmed with scissors, always with a sharp knife. Catgut should be used if possible for suture material: if there is any tension, catgut which has been treated to resist absorption. If it has been necessary to free the nerve from surrounding fibrous tissue, care must be taken that it does not again become adherent; for this purpose chromicized Cargile membrane, fatty tissue, or a fascial flap should be wrapped around the point of suture and as much of the nerve above and below as has been freed. After closure of the wound, the limb must be put up as after primary suture.

It is often the case that the ends do not come so readily into apposition as after primary suture. Preliminary stretching will gain an inch in the arm or leg quite

readily ; this, combined with relaxation of the joint or joints over which the nerve passes, will rarely fail to enable the ends to come into apposition.

If the ends of the nerve do not come into apposition, we have a choice of methods that have been used from time to time, more or less successfully, to bridge over the gap left ; I shall mention only those of proved value. These are, the transplantation of nerve from another source ; union of the nerve by catgut threads combined with tubular suture, that is, surrounding the ends of the nerve and the catgut with a tube composed of some material which will resist absorption for a length of time sufficient to prevent the ingrowth of fibrous tissue between the ends of the nerve ; the union of the nerve to a neighbouring sound nerve ; and finally, shortening the limb by removal of bone.

The nomenclature at present in general use requires simplification. The same terms have been used by different surgeons to denote dissimilar operations, with results which are bewildering, not only to the practitioner and student, but also to those engaged in research. I have suggested, and use, the following : *Nerve transplantation* ; *Nerve anastomosis* ; *Nerve crossing*. I consider that the term ' nerve-grafting ' should be discarded : it has always meant to the English-speaking surgeon the insertion of a portion of nerve between the ends of a divided nerve ; but it has been employed to denote also the anastomosis of one nerve to another, a meaning it conveys to Continental surgeons.

It the ends of the nerve cannot be brought together, transplantation is the operation of choice. The portion of nerve employed must be obtained from the patient or from an amputated limb. The results, both clinical and experimental, when a portion of an animal's nerve is used, are unsatisfactory. The nerve most often requiring this operation is the musculospiral. Here the operation is simple : the incision is prolonged downwards, the radial nerve exposed, and an adequate portion resected and sutured into the gap without tension. This nerve may be used in a similar way in injuries of other nerves. Removal of the upper two-thirds of the radial nerve produces no demonstrable effect upon sensation. The internal saphenous nerve may be used to fill in gaps elsewhere.

But this method may be inapplicable for anatomical reasons—for example, after division of the facial nerve in the middle ear ; or from the size of the nerve—for example, the great sciatic ; or on account of the distance between the ends of the nerve—if this exceeds four inches, it seems probable that no operation of this nature will succeed. Nerve anastomosis offers the best chance of success. In cases in which the gap between the ends is less than four inches, and yet, because of the size of the nerve or other reason, nerve transplantation is impossible, and no sound nerve is available for anastomosis, tubular suture should be performed.

Nerve anastomosis is divided into central and peripheral, either of which may be partial or complete (*Figs.* 50–53, in which the shaded lines show the affected nerves). In complete anastomosis the whole of the nerve to be implanted is divided ; in peripheral anastomosis the distal end of the affected nerve is anastomosed to the sound nerve ; in central, the sound nerve is divided and its proximal end anastomosed to the affected. In the case of small nerves, a vertical slit in the sound nerve divides enough of its nerve-fibres ; but when the nerve is of large or medium size, a transverse cut should be made into it or a flap raised. Our aim in all these operations is to bring the axis cylinders of the affected nerve into end-to-end contact with some of those in the sound.

The complete peripheral operation is the one which is most often applicable to the cases we are now considering.

Complications arising during Recovery after Complete Division.—Complications may arise during the progress of recovery. Pain as a rule is present in the distribution of the nerve during the first two or three days after suture. This is due to irritation of the central end, and is rarely of sufficient severity to need treatment. If severe, it points to an infective neuritis ; the wound should be inspected, and, if showing signs of infection, opened up and drained. If this has been necessary, the condition of the nerve should be explored as soon as the wound has healed (*see below*, under Hyperalgesia). In other cases in which suppuration takes place, gradual deterioration of function due to involvement of the junction in fibrous tissue may occur after a period of improvement. This may arise also from inflammation around a silk suture used to unite the ends of the nerve. It is for this reason that the use of silk is unwise. In both cases the nerve should be exposed and dealt with.

Ulcers may arise at two periods: during the stage of complete insensibility to cutaneous stimuli slight injuries pass unnoticed; the patient burns himself not infrequently, or, if engaged in manual labour, may injure the affected limb, causing ulceration. These ulcers heal readily when the part is kept at rest and the usual means are adopted to render the ulcers healthy. To this group belong the so-called perforating ulcers which arise after division of the sciatic nerve. With the first sign of returning sensibility to prick, the patient not infrequently experiences pain shooting into the affected part; at this time blisters are liable to form spontaneously, the patient not uncommonly noticing them on rising in the morning. If not carefully treated these burst, leaving a raw surface, which readily becomes infected: the blisters must be protected from injury; under these conditions they dry, leaving a scab. After complete restoration of sensibility to prick, all tendency to ulceration ceases.

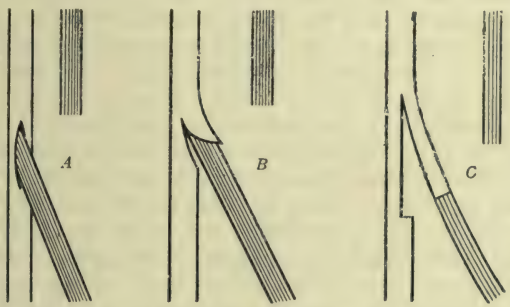


Fig. 50.—Complete Peripheral Anastomosis, showing the three methods of union.—*A*. Insertion of peripheral end of affected into vertical slit in sound nerve. *B*. Insertion of peripheral end of affected nerve into a gap in the sound nerve, produced by an oblique incision. *C*. End-to-end union with flap raised from sound nerve.

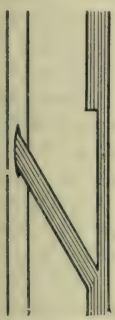


Fig. 51.—Partial Peripheral Anastomosis. Can also be carried out by methods *B* and *C*, *Fig.* 50.



Fig. 52.—Complete Central Anastomosis. Can also be carried out by methods *B* and *C*, *Fig.* 50.



Fig. 53.—Partial Central Anastomosis. Can also be carried out by methods *B* and *C*, *Fig.* 50.

Tenotomy or tendon lengthening may be necessary in cases in which the limb has been allowed to get into a bad position.

Treatment of Cases of Subcutaneous Injury.—As the result of a subcutaneous injury, all the signs of complete division may ensue; there is no sign which can tell us whether the nerve is anatomically or physiologically divided, that is, whether the nerve is ruptured or in anatomical continuity. These cases are not uncommon; they may result from pressure suddenly applied or long continued, or from traction.

It may be impossible to diagnose between complete and incomplete division until ten or fourteen days after the injury. If at this period the signs of complete division are present, no time should be lost; the condition of the nerve should be explored, and the appropriate treatment adopted. If physiological division is found, in most cases it will be necessary to resect the damaged portion and perform end-to-end suture. If this is not done, recovery will be incomplete. If on exploration the nerve seems little altered, although the reaction of degeneration is present, it is wise to leave it, wrapping it to prevent adhesions to surrounding structures.

If the muscles still react to faradism at the end of a fortnight, recovery will ensue in the course of a few weeks if careful treatment is adopted. When the reactions which I have described as being typical of incomplete division are present, no operation should be done in a recent case, and the nutrition should be kept up, as I shall describe when speaking of after-treatment. If the nerve has become secondarily involved, or if improvement does not take place with careful treatment, operation should be performed and the nerve released from pressure of fibrous tissue, bone, or whatever the agent may be. Whenever this operation (neurolysis) is performed, the nerve should be wrapped in tissue to prevent it from again becoming adherent; failure to do this has necessitated repeating the operation.

Treatment of Nerve Injury complicating Fractures and Dislocations.—Nerves may be injured as the result of fractures; this is particularly liable to occur to the musculospiral in fractures of the middle and lower thirds of the humerus; next in frequency the external popliteal in fractures of the head of the fibula; and rarely the median in fracture of the lower end of the radius. The nerve may suffer at the time of the accident, or later from involvement in callus or the pressure of displaced bone; the latter may occur years after the fracture. Primary injury is probably more common than is suspected. If at the time of the first examination of a recent fracture, particularly of the humerus, symptoms of nerve injury be present, operation should be performed if there are no general causes contra-indicating it. The condition found should be dealt with according to the rules I have laid down, and precautions taken to avoid the involvement of the nerve in fibrous tissue. If the fact of nerve injury be discovered, as it usually is, when the splints are removed, and examination reveal complete division, operation should be performed. If on the other hand the symptoms point to incomplete division, the appropriate non-operative treatment must be carried out; if no improvement take place after several weeks, the nerve must be exposed and the lesion dealt with. But if the signs of nerve injury develop later, when the patient begins to use the limb, operation must not be delayed.

In some instances, as will be mentioned when speaking of the ulnar nerve, interference with the function of the nerve takes place many years after the original injury. If the symptoms are slight, rest will undoubtedly relieve them for a time, but they are likely to recur. Operation is the most satisfactory treatment, removing the compressing agent.

It occasionally happens that nerves are injured as the result of dislocations, either by direct violence or from faulty treatment. This occurs most often in dislocations of the shoulder. The whole plexus may suffer injury, but most often the inner cord. (*See also* Brachial Plexus, *infra.*) In subglenoid dislocations the circumflex nerve sometimes suffers; in the reduction of dislocations of the hip, congenital or acquired, the great sciatic or anterior crural nerves may suffer; in forward dislocations of the head of the radius, the posterior interosseous nerve. These cases are to be treated on the lines laid down in speaking of subcutaneous injuries in general.

Complications arising during Recovery after Incomplete Division.—Although, in a large proportion of the cases, recovery steadily advances and at length becomes perfect, occasionally, after a period of improvement, gradual deterioration of function takes place, the result of fibrous changes in the nerve. The nerve should be exposed and the condition dealt with, resection of the damaged portion being required in most cases.

Hyperalgesia.—Pain is more often associated with incomplete than with complete division. It may arise in cases of anatomical or physiological division, more often in the former, and is referred to the 'full' distribution of the affected nerve. In many cases it is accompanied by tenderness of the skin, the pain and tenderness involving a larger area than that which becomes insensitive after complete division of the nerve; in a few cases it is accompanied by glossy skin. All are characterized by the latent period which exists between the injury and the onset of pain and tenderness. The sensory loss varies in extent and degree with the injury and the nerve involved, but is never complete. In every case exploration must be carried out. Treatment will depend upon the degree of destruction of the nerve. If the signs point to an almost complete division, after exposure of the nerve, the damaged portion is resected, and end-to-end suture performed. If, on the other hand, the signs point to incomplete division, and the condition of the nerve when exposed shows the injury to have been slight, the nerve well above the injury should be injected with 80 per cent alcohol.

Irritation of one of the terminal branches of a nerve may cause pain and tenderness in the whole of the area supplied by the parent nerve, with twitching in the muscles in the case of a nerve containing motor fibres. These symptoms are most familar in connection with the fifth nerve, but most often require treatment elsewhere. Terminal involvement of digital nerves is by no means uncommon after amputations for injury, and acquires great importance in connection with compensation. The pain is in the stump at first, but later involves the whole area supplied by the affected nerve, which area may be tender when the point of a pin is lightly drawn from sound to affected parts. The pain, if neglected, may spread as the result of an ascending neuritis. The skin of the stump is of a bluish-red colour, and this may later appear over the whole tender area. On gentle examination of the end of the stump one or two tender spots are met with, pressure upon which causes acute pain. In late cases, paresis of the muscles supplied by the nerve affected may appear.

Treatment consists in excising the scar, together with the involved nerve twig. This should not be delayed, but carried out as soon as the diagnosis has been made. The limb should then be kept at rest on a splint, and massage employed until recovery is complete.

In long-standing cases these forms of treatment may fail to relieve the pain, whether due to irritation of the nerve in its course, or one of its terminal branches. Intradural resection of the posterior roots from which the affected nerve springs offers the only hope of relief, and even this may be unsuccessful.

After-treatment.—The patient, and occasionally the surgeon, are prone to consider that when the anatomical continuity of a nerve has been restored by operation, nothing more remains to be done; but the final result depends on the thoroughness with which, for several years it may be, the after-treatment is carried out. That nerves regenerate when their ends are in contact is known, but it too often happens that, by the time motor recovery has taken place, the muscles have been allowed to waste, and contractures have taken place in muscles and ligaments.

The parts supplied by the nerve must be kept in a state of good nutrition, and care taken to prevent over-stretching of the paralyzed muscles with contracture in their opponents. The affected muscles must be kept relaxed by suitable splints. Massage is invaluable in keeping up the nutrition of the skin and the muscles, and in cases of musculospiral or external popliteal injuries perhaps it is enough; but in ulnar injuries it should certainly be supplemented by daily stimulation with both the constant and interrupted currents. This should be done always under medical supervision. Complications must be treated as they arise, and with patience most cases of nerve injury will give a good result. Incomplete injuries not needing operation are treated in this manner. (*See* Electrotherapeutics.)

Prognosis.—There are a few general points which must be referred to in regard to prognosis. In order that complete recovery shall ensue, healing must be by first intention, and care be taken that the nutrition of the muscles be kept up and contractures prevented. If these rules are followed, perfect recovery will take place in the majority of the cases of primary suture. In cases of secondary suture, the prognosis depends on the condition of the muscles at the time the patient comes under observation and the manner in which the original wound healed. With regard to time, up to three years from the injury it makes little difference to the regeneration of the nerve, but it may make all the difference in the amount of contracture which has taken place. It is unlikely that *perfect* recovery will ensue after secondary suture; if a patient is unfortunate enough to require secondary suture of the ulnar nerve, it is improbable that the hand will be restored to its normal condition. But after secondary suture of the musculospiral or external popliteal, imperfect sensory recovery is immaterial, and the contractures are slight and easily dealt with; so that the functions of the part, from the point of view of the patient, are completely regained.

SPECIAL METHODS OF TREATMENT.

Neurotomy and Neurectomy.—The operations of dividing a nerve (neurotomy) and of removing a portion of it (neurectomy) have been chiefly employed in connection with the treatment of various painful and spasmodic affections.

Neurotomy has been superseded in the treatment of neuralgia by neurectomy, and the latter in many cases by division of posterior roots or removal of the posterior root ganglion. In certain cases, e.g., pain following a nerve injury, neurectomy is employed, the damaged portion being removed and the continuity of the nerve re-established by suture.

In performing neurectomy for neuralgia, as much as possible of the nerve should be removed, to prevent the possibility of reunion; in some cases the nerve may be pulled out. The same operation may be employed in cases of spasmodic affections, but, where possible, nerve anastomosis should be carried out.

Division of Posterior Roots.—Intradural resection of posterior roots is occasionally indicated for the relief of pain in long-standing cases of traumatic neuritis, due to wounds of nerves and to involvement of nerves following amputations; rarely for the relief of pain in malignant growths. Recently it has come into prominence in connection with the treatment of spastic paraplegia (Förster) and of the gastric crises of tabes. In both conditions considerable relief has been afforded. The case must be carefully studied and care taken to divide one root above and below those supplying the affected area. The laminæ over the region to be operated on are removed, the dura is opened, and the roots are divided with sharp scissors close to the cord and at their exit from the dura. In many cases it can be carried out by removing the halves of the laminæ on the affected side (unilateral laminectomy, Taylor).

Nerve Anastomosis.—The varieties and indications for the employment of this operation in injuries of nerves have already been described. But the operation is of value also in the treatment of paralyses due to central causes, particularly infantile paralysis, and also in the treatment of various spasmodic affections.

The suitable cases of infantile paralysis are those in which a group of muscles supplied by one nerve is affected, such as the peroneal group, or the Erb-Duchenne; or single muscles, as the tibialis anticus, soleus and gastrocnemius, or quadriceps extensor cruris. The operation must not be performed until treatment by massage and galvanism has been faithfully tried, the affected muscles being kept relaxed for at least two months; and in no case until six months have elapsed since the onset of the disease. But no time seems too advanced to try this operation with good hope of a successful result, provided muscle substance is left and the limb can be brought into a normal position.

Considerable success has followed this treatment in many cases, particularly in those in which the external popliteal group of muscles has been affected. So far no great success has been obtained in the upper limb.

The form of anastomosis suitable to the majority of the cases is the complete peripheral (*Fig.* 50). Our aim in this operation is to bring as many as possible of the axis cylinders of the nerve supplying the affected muscles into end-to-end contact with cut axis cylinders in the sound nerve, at the same time preserving the muscles supplied by the latter nerve. In the case of small nerves, such as those supplying the tibialis anticus or muscles of the calf, a vertical slit in the sound nerve divides sufficient axis cylinders (*Fig.* 50, *A*). For example, in a case of paralysis of the tibialis anticus, the anterior tibial nerve is exposed, the branches given to the muscle identified and divided close to the nerve, and inserted into a vertical slit in the musculocutaneous nerve.

In the case of larger nerves, for instance the external popliteal, a flap consisting of about one-third should be raised from the sound nerve, and the peripheral end of the divided nerve supplying the affected muscles either sutured into the gap or united end to end with the flap—the latter is probably the best (*Fig.* 50, *B* and *C*). In paralysis of the quadriceps extensor cruris, complete central anastomosis may be performed, the superficial division of the obturator being divided and inserted into the deep portion of the anterior crural nerve.

Similar operations may be carried out in paralysis due to other central lesions, and in spasmodic affections.

The after-treatment must be carried out patiently, the nutrition of the affected muscles being kept up by means of massage and the constant current. When the first sign of voluntary power returns the patient must be instructed to exercise the muscles systematically; in this way co-ordinate movements will be gradually restored.

The time at which the first sign of voluntary power is discovered depends upon the

distance of the point of anastomosis from the nerve-endings in the muscles. Where this is short, as in the tibialis anticus or calf muscles, improvement should be noticed in three or four months; but in the case of the external popliteal or roots of the brachial plexus, twelve or eighteen months may elapse.

INJURIES OF SPECIAL NERVES.

Ulnar Nerve.—There are two affections of the ulnar nerve that need special mention: interference with the functions of the nerve coming on late, it may be twenty or thirty years after an injury, usually fracture in the region of the elbow-joint; and dislocation of the nerve from its groove behind the internal condyle.

Chronic Neuritis of the Ulnar Nerve in Connection with Old Injury in the Region of the Elbow.—This is a condition not infrequently overlooked. The injury may have been in childhood, and entirely forgotten. Sometimes after extra exertion, at other times—and more often—without any known cause, the patient complains of a feeling of pins and needles in the ulnar area, and of weakness of the hand. This should always lead the surgeon to suspect pressure on the nerve or on one of the anterior primary divisions of which it is composed. The course of the nerve should be traced upwards and the elbow-joint examined; in the cases we are now considering, considerable deformity will usually be found in the situation of the internal condyle, often with partial or complete obliteration of the groove in which the nerve lies. The nerve can often be felt thickened in a spindle-shaped manner. As in all pressure injuries, the motor and the sensory fibres are equally affected.

If signs of complete division are present, operation must be performed without loss of time. The nerve should be exposed, and the damaged portion resected; before uniting the ends, the humerus should be examined and, if necessary, a groove made to receive the nerve. After suture, the nerve must be wrapped to prevent the formation of adhesions, the wound closed, and the arm put up in extension to avoid traction on the nerve junction. Appropriate after-treatment must be carried out. In cases in which the lesion is incomplete, rest will often relieve the symptoms, but there is a great liability to recurrence as soon as the patient resumes the use of the arm. If will save time if, in every case in which definite signs of interference with the functions of the nerve are present, operation is performed. The nerve must be exposed and the cause of the pressure removed, a new groove being cut for the nerve behind the internal condyle when necessary.

Dislocation of the Ulnar Nerve.—Abnormal mobility of the ulnar nerve is of common occurrence, and gives rise to no symptoms; it is found in individuals in whom the physiological cubitus valgus is more marked than usual, occasionally in those in whom cubitus valgus is the result of injury. This condition, which may be called subluxation of the ulnar nerve, is the predisposing cause of dislocation, and this name should be reserved for those cases in which the nerve travels over the internal condyle. This can occur only in flexion of the forearm, and in most cases a fall on the flexed elbow is given as the cause. This probably ruptures the fascia which keeps the nerve in position. The condition occurs most often in males between the ages of twenty and thirty. In most cases the symptoms come on immediately after the injury; occasionally some time elapses, the frequent injuries to which the nerve is subject in passing over the internal condyle causing fibrosis. In a few instances the condition originates without injury; in these patients the fascia which keeps the nerve in place is gradually stretched.

In a large proportion of cases it will be found that operation is necessary; if symptoms are present pointing to interference with the functions of the nerve, treatment must not be delayed. The nerve should be exposed and brought to the anterior surface of the condyle, where it will lie without being exposed to pressure. In cases that have been neglected, in which a diffuse fibrosis is present leading to all the signs of complete division, it will be necessary to resect the damaged portion of the nerve; this will, however, rarely be required.

Note.—In the treatment of all cases of ulnar injury, great care must be taken to prevent the ulnar claw-hand becoming permanent. Until the restoration of voluntary power, the interossei must be kept relaxed by means of a splint devised to maintain the fingers flexed at the metacarpophalangeal, and extended at the interphalangeal joints.

Musculospiral Nerve.—After the median and ulnar, this nerve is the one most frequently injured. It most often suffers in fractures of the humerus in its middle and lower thirds, and is the nerve commonly involved in crutch, sleep, and anæsthetic paralyses.

During recovery, whether from complete or incomplete division, the carpal extensors first regain power, then the extensors of the fingers, and finally those of the thumb.

Note.—Until the restoration of voluntary power the paralyzed muscles must be kept relaxed, the hand being held hyperextended with the fingers extended by a suitable splint.

Circumflex Nerve.—Injury to the circumflex nerve is by no means so common as is usually supposed. It has been said to follow direct blows on the point of the shoulder; it is perhaps possible that the fibres of the nerve as they lie under the deltoid are injured, but in most cases the injury is to the anterior primary division of the fifth cervical nerve, and careful examination will show that the spinati also are affected. In other cases the wasting of the deltoid on which the circumflex injury was diagnosed is found to be, in common with all the muscles around the joint, the result of a traumatic arthritis.

The most careful examination is necessary before coming to a decision with regard to treatment; the testing must be carried out for all forms of sensibility. If there be no loss of sensibility, and there is paralysis of the deltoid with the reaction of degeneration it is extremely improbable that the circumflex nerve is injured; if the signs are those of complete section of the nerve, the age of the patient and his occupation must be taken into consideration. In most cases operation can be avoided by training the neighbouring muscles to take the place of the deltoid. If it is essential that perfect movement be obtained, operation must be resorted to. The nerve may be exposed through an incision half an inch behind and parallel to the posterior border of the deltoid muscle.

Long Thoracic Nerve (Nerve of Bell).—This nerve supplies the serratus magnus muscle. It is most often injured in males between the ages of twenty-five and forty, and usually on the right side. Generally caused by prolonged pressure in the supraclavicular region, it occasionally follows violent muscular efforts and direct violence applied to the shoulder. Paralysis of the serratus magnus is rarely isolated, but is usually combined with paralysis of the lower trapezius.

Careful examination is necessary in order to enable a prognosis to be made. If the case is seen early, avoidance of all injurious pressure in the supraclavicular region, and absolute rest to the arm, must be ordered. This must be followed by massage and stimulation with the interrupted current applied to the muscle.

If the paralysis persists, and the reaction of degeneration develops, nerve anastomosis should be performed, or the insertion of the sternocostal part of the pectoralis major may be transplanted to the lower angle of the scapula. It is usually impossible to deal directly with the damaged portion of the nerve or the branches of which it is composed.

Brachial Plexus.—The plexus may suffer injury (1) above or (2) below the clavicle; in the former case it is usually the anterior primary divisions of the cervical nerves entering the plexus that suffer; in the latter, the cords of the plexus. Most of the injuries are subcutaneous: above the clavicle, the result of traction; below, usually the result of pressure. Penetrating wounds are rare in civil practice.

1. Supraclavicular Injuries.—*Complete Plexus.*—The majority of cases of injury in this situation follow violence applied in such a way to the head or shoulder as to stretch the plexus. The injury first affects the fifth and then the other primary divisions in order, from above downwards.

Of isolated lesions, the fifth cervical and the first dorsal are the only common ones.

Nerve Symptoms due to Presence of Cervical Rib.—When symptoms result from the presence of a cervical rib, in seventy per cent of the cases they are nervous in nature. They occur more often in women, and on the right side. Symptoms usually appear in early adult life, and are due in most cases to pressure upon the lowest trunk or nerve entering the plexus.

Treatment consists in removal of the supernumerary rib and the periosteum covering it. This must be followed by the appropriate after-treatment directed to the affected muscles. In a few instances a normal first rib may be the agent producing the symptoms. In these cases the portion of rib over which the lower trunk of the plexus passes should be removed. Before resorting to operation, the possibility of the wasting

of the intrinsic muscles of the hand being due to some other condition must be carefully considered. I have recorded a case in which syringomyelia was complicated by the presence of cervical ribs, and it is on record that cervical ribs have been removed for symptoms proved after operation to have been the result of this disease.

2. Infraclavicular Injuries.—In the majority of cases these are the result of pressure, most often from the head of a dislocated humerus, occasionally from reduction of the dislocation by the 'heel in axilla' method. In other cases they may be due to fracture of the humerus or of the neck of the scapula.

The whole plexus may be injured, but the inner cord is most often affected, then the posterior, and finally the outer.

Diagnosis.—In every case of brachial plexus lesion, in addition to the fact of complete or incomplete division, the exact point of injury must be worked out; cases are not unknown in which the plexus has been explored below the clavicle when the lesion has been supraclavicular. Careful examination will alone avoid the mistake.

There are four important leading symptoms in this examination: (1) The condition of the scapular muscles. It will be found that the nerve of Bell is an important guide; if the serratus magnus is unaffected, we know the lesion is not of the anterior primary divisions; next the spinati muscles—it is sometimes possible to locate an injury to between the points at which the nerves supplying these muscles and the serratus magnus are given off. (2) The grouping of the paralyzed muscles; for instance, it is obvious that no combination below the clavicle will paralyze the Erb-Duchenne group. (3) The condition of the pupil, and (4) The presence or absence of anæsthesia.

After diagnosis of the exact spot, treatment must be carried out along the lines already laid down; complete injuries must be explored and the appropriate treatment adopted. When the whole plexus is affected as the result of indirect violence, e.g., falls on the shoulder, exploration should be undertaken immediately, without waiting to ascertain whether the division is complete or incomplete. In no instance in which operation was undertaken at a period after the accident has the result been satisfactory. There is, however, an exception to the rule that incomplete injuries should not be treated as a routine by open operation. I have already pointed out that an incomplete division of the fifth root may be followed by the development of the reaction of degeneration in the deltoid and spinati. This should always be treated by operation, and the damaged portion, which will be found on the upper and outer aspect of the nerve, resected, and a portion of the radial nerve transplanted; or this damaged portion may be anastomosed to the anterior primary division of the sixth cervical nerve.

With regard to prognosis of injuries of the brachial plexus, this is unfavourable, and is due in the first place to the nature of the injury. In a large proportion of cases the nerves are overstretched, and this results in hæmorrhage into the sheath and consequent fibrosis; in addition, if it leads to rupture the fibres give way at different levels; hence spontaneous recovery is unusual when the signs of complete division are present, and is apt to be imperfect in cases of incomplete division. Again, it is possible that the injury in some cases tears the roots away from the cord. Even after operation the prognosis is not so good as, for example, after secondary suture of the median at the wrist, or the musculospiral. This has to do to a great extent with the length of time necessary to complete recovery; in many cases the patient ceases to attend for efficient after-treatment, and when recovery of the nerve has finally become complete, the muscles are atrophic, and contractures of the opponent muscles render the regeneration of the nerve futile. Careful treatment at the time of the injury, and unceasing, patient after-treatment, will improve the prognosis. It cannot be too strongly impressed upon the patient that the operation only puts him in a condition favourable to recovery, and that possibly years of patient treatment must be carried out if success is to be obtained.

Sciatic Nerve.—Injuries of this nerve are rare in civil practice. Penetrating wounds of the upper part of the thigh are uncommon, but injury has followed traction, the result of the bloodless method of treating congenital dislocations of the thigh. Lesions of this nature usually result in incomplete division, and the external popliteal portion of the nerve suffers most, sometimes exclusively.

Treatment is carried out along the usual lines, but it must be remembered that an incomplete injury of the sciatic may be a complete injury of the external popliteal, so

that it may be necessary to expose the great sciatic nerve and deal with its external popliteal half.

External Cutaneous Nerve.—It is but rarely that this nerve is divided: it sometimes suffers section in opening a psoas abscess, but the resulting anæsthesia causes little inconvenience. This nerve is of importance from its involvement in disease; Bernhardt's disease, or meralgia paræsthetica, is characterized by pain in the distribution of the external cutaneous nerve of the leg, usually with alteration in sensibility. It is most common in males, and many patients give a history of injury; or it results from the pressure of an ill-fitting truss. Symptoms begin with a feeling of tingling or of coldness in the distribution of the nerve; this increases, and pain, which disappears on resting, is experienced on standing or walking. A tender spot is sometimes present just where the nerve issues from under Poupart's ligament, and the area supplied by the nerve shows changes in sensibility. As a rule it is tender, and sensibility to touch and pain is defective.

Treatment is unsatisfactory. Rest should be first tried; if this fails, the nerve should be injected with 80 per cent alcohol. Operation should not be resorted to unless this fails and there is a distinct history of injury, or a thickening of the nerve is felt. In these cases excision of the damaged portion of the nerve is likely to relieve the condition but in some of the patients submitted to operation the cause of the condition was not discovered; excision of a portion of the nerve afforded relief for a short time, but the pain recurred.

Facial Nerve.—Facial paralysis may result from a lesion above or at the nucleus of the nerve; between the nucleus and the internal auditory meatus; during its passage through the temporal bone; and externally. In lesions at or above the nucleus, the orbicularis palpebrarum escapes. Its course below this point can be divided into three stages: above the geniculate ganglion; between the ganglion and the point at which the chorda tympani is given off; and below the chorda. In all these situations division of the nerve produces complete facial paralysis, but in the first and last taste is not affected, while if divided between the geniculate ganglion and the origin of the chorda, that is, in the middle ear, taste will be lost over the anterior two-thirds of the corresponding half of the tongue.

Apart from the so-called 'rheumatic' affections of the nerve (Bell's palsy), which are the common cause of facial paralysis, interference with the function of the nerve in the middle ear is the most usual. This may result from disease, or from operation. The nerve may suffer in fractures of the base of the skull primarily, or more often from involvement in callus. Outside the skull it is often injured during operations in the parotid region or in the removal of tuberculous glands, or from forceps pressure during childbirth; in most of these cases the nerve injury is incomplete, and recovery ensues.

In every case of facial paralysis, the site of the lesion should be discovered; this is often obvious from the history of middle-ear disease or operation. In other cases attention to the symptoms given above will lead to diagnosis of the seat of the lesion. The degree of the injury sustained by the nerve must next be ascertained, whether complete or incomplete division, by testing the reactions of the affected muscles.

In cases of incomplete division the usual treatment directed towards maintaining the nutrition of the paralyzed muscles must be adopted. When due to middle-ear disease the complete mastoid operation must be carried out; facial paralysis is an indication for this operation. When the reaction of degeneration is present, showing that complete division, either anatomical or physiological, has occurred, the treatment to be adopted depends on the cause. If it follows a radical mastoid operation, the sooner treatment is carried out after the wound has healed the better; in cases of Bell's palsy it is justifiable to wait for six months before operating. If the nerve is divided during the course of mastoid operation, the ends should be adjusted in the aqueduct, when restoration of function may be expected unless neuritis is set up as the result of sepsis. If discovered after operation, the reaction should be tested at the end of a fortnight; if the reaction of degeneration is present, the wound should be opened up and an attempt made to adjust the ends. If this fails, nerve anastomosis must be undertaken. It must be remembered that the injury during mastoid operation is in most cases incomplete and that spontaneous recovery follows the usual non-operative treatment.

In many cases of facial paralysis submitted to operation, end-to-end union is out of the question, and a neighbouring nerve must be utilized. The nerves that have been used are the spinal accessory or one of its branches, and the hypoglossal; they have been completely divided, and end-to-end union performed with the peripheral end of the facial (nerve crossing), or united to the side of the nerve (anastomosis). The hypoglossal is the nerve of choice; dissociated voluntary movement is restored more quickly after anastomosis to this nerve than when the spinal accessory is used. Nerve anastomosis, and not nerve crossing, should be performed; there is no necessity to sacrifice the hypoglossal nerve: emotional dissociated movement will return without. It is probably better to make an incision into the hypoglossal nerve, and not simply a vertical slit, for return of co-ordinate voluntary movement is more rapid when axis cylinders in the affected nerve are divided (*Figs.* 50–53).

In order to carry out the operation, a long incision should be made extending from the mastoid at the level of the external auditory meatus down to the great cornu of the hyoid. The anterior border of the sternomastoid is pulled back, and the posterior belly of the digastric identified after separation of the parotid. The digastric is then pulled backwards, and if large it may be necessary to divide its upper border. The facial nerve is next identified, this being most easily done by feeling for the styloid process of the mastoid; the nerve passes out immediately in front of this and enters the parotid gland. The nerve is freed, and an attempt is made to pull the stump out of the foramen in cases in which there is reason to believe that the nerve was divided in the course of an operation on the middle ear. If this cannot be done, the nerve is divided in the foramen as high as possible with a tenotomy knife. The hypoglossal must next be identified; the transverse process of the axis is first felt, then the occipital artery is sought, which usually runs upwards and outwards across the process. The internal jugular vein is next found and retracted inwards; this exposes the hypoglossal nerve. With it is running the vagus, but the hypoglossal is easily identified from the course it is taking. It is freed, and brought towards the facial; an oblique cut should be made through about one-third of its trunk and the peripheral end of the facial sutured in with fine catgut. If there is any tension it is better to raise a flap consisting of one-third of the hypoglossal, and unite it end to end with the facial. The raw surface and the junction should be surrounded with Cargile membrane. The wound should now be closed, putting in a tube for twenty-four hours if necessary.

The after-treatment must be patiently carried out. The nutrition of the muscles must be kept up by means of massage and the application of a constant current until such time as voluntary power begins to be restored. As soon as power of voluntary movement returns to each group of muscles, they must be exercised systematically until the patient regains complete control.

The prognosis varies with the cause of the paralysis, being better when the division results from injury than when it is the result of neuritis. Suppuration of the operation wound renders success doubtful. If the case is to recover, the first sign usually appears about the third or fourth month, the face while at rest becoming more symmetrical, although there is no return of voluntary power. Within a few weeks it is noticed that the angle of the mouth can be moved, at first only with movements of the tongue; then the muscles of the upper lip, and finally those of the forehead. With exercise, the movements become dissociated, and finally emotional movement returns.

For a few weeks after operation, the side of the tongue supplied by the hypoglossal nerve which was used is paralyzed, causing difficulty in speech and deglutition; this passes off in a few weeks, but the affected side of the tongue remains smaller for a considerable time.

Lingual Nerve.—It is occasionally necessary to resect a portion of this nerve for neuralgia involving the tongue, or for the relief of pain in inoperable carcinoma. The injection of 80 per cent alcohol should always be tried first.

The nerve may be exposed through a trephine opening in the ascending ramus of the lower jaw, the centre of the opening being at the meeting of a line drawn backwards from the alveolar margin with one drawn vertically upwards from the angle of the jaw. The nerve will be found lying in front of the inferior dental nerve; about an inch should be resected.

Division of the nerve through the mouth should be avoided; it is uncertain, and the wound is liable to become infected.

Cervical Sympathetic.—The sympathetic cord in the neck may be injured as the result of penetrating wounds, surgically or accidentally inflicted. It may be pressed upon by or involved in tumours of various kinds, or its white rami communicantes injured as they pass out in the first and second dorsal roots. (*See* BRACHIAL PLEXUS, *supra.*)

Section of the sympathetic in the neck produces slight enophthalmos and pseudo-ptosis (the upper lid droops but can be elevated voluntarily). The pupil is smaller than on the sound side, and does not dilate when shaded, or in response to cocaine or to pinching the side of the neck (ciliospinal reflex). The affected side of the face does not flush or sweat. Stimulation of the cervical sympathetic is sometimes observed as the result of the pressure of tumours or the traction of adhesions. It results in exophthalmos, widening of the palpebral fissure, and dilatation of the pupil.

The cord and ganglia may be removed through an incision along the posterior border of the sternomastoid. The carotid sheath and its contents are exposed and drawn forwards and inwards, and the sympathetic found behind it.

Resection in whole or in part has been performed, with results that are open to question, in cases of idiopathic epilepsy, glaucoma, Graves' disease, and epileptiform neuralgia. The surgery of the sympathetic is still in the experimental stage.

Spinal Accessory Nerve.—The external or spinal portion of this nerve is not infrequently divided during the course of operations upon the neck, particularly during the removal of tuberculous glands. It must not be forgotten that the spinal portion of the nerve may be involved in the vertebral canal. It supplies the sternomastoid, together with branches of the second and third cervical nerves; and the trapezius, with the aid of fibres from the third and fourth cervical nerves.

Many of the cases of accidental section, particularly those due to extensive operations upon tuberculous glands, affect at the same time the branches of the cervical nerve to the trapezius, producing its complete paralysis.

If the nerve be divided during the course of a surgical operation, it should be immediately sutured. The deformity resulting from paralysis of the trapezius is marked, and an attempt should be made in every case to deal with it by operation. The spinal accessory nerve should be exposed through an incision along the anterior border of the sternomastoid, and an attempt made to perform secondary suture. If it be impossible to bring the ends into contact or to find the upper end, the peripheral end should be anastomosed to the anterior primary division of the third or fourth cervical nerve. When the cervical branches are divided in addition, an attempt must be made to obtain the nerve-supply again from the third and fourth cervical by suture or anastomosis.

To expose the spinal accessory nerve, an incision is made along the anterior border of the sternomastoid with its centre opposite the angle of the jaw. The border of the muscle is defined and pulled outwards, and the nerve is often seen entering it. If this fail to bring it into view, dissection at the posterior border of the digastric, remembering the direction of the nerve, will expose it as it passes out from under the muscle. (*See also* BIRTH PALSY; FACIAL SPASM; NEURALGIA; NEURALGIA, EPILEPTIFORM; NEUROMATA; PALSIES, CEREBRAL, OF CHILDHOOD; WRY NECK.) *James Sherren*

NEURALGIA.—The commonest manifestation is that which occurs in the distribution of the trigeminal nerve from dental irritation, the pain being referred to any of the three divisions of the fifth nerve. Other forms of irritation in the distribution of the sensory division of the fifth will give rise to neuralgia, as for instance irritation about the nose, pharynx, eyes, and ears, and exposure to cold and injury. Brachial and intercostal neuralgia are also relatively common manifestations of the disease.

Neuralgia may be due to rheumatic, gouty, diabetic, malarial, or syphilitic conditions. Anæmia—by whatever cause produced—will often provoke an attack. The successful treatment depends on finding the source of the peripheral irritation, which is by no means always in close relation to the seat of the pain. In neuralgia of the face the teeth have to be carefully examined, not only for caries, but also for other abnormalities of the roots and gums. The possibility of an impacted wisdom tooth must always be borne in mind. The eyes have to be carefully examined, not only for the more mark-

degrees of errors of refraction, but also for the slighter degrees of hypermetropia, which readily escape observation. Other more obvious conditions of the eye, such as iritis and glaucoma, may be the cause of 'neuralgia'.

Suppuration in the antrum and sinuses also gives rise to neuralgia ; or again, it may be the earliest symptom of intracranial disease and of tumours, syphilitic or otherwise, situated at the base of the brain. Brachial neuralgia may be due to the presence of a cervical rib. A very severe and persistent neuralgia may follow an attack of herpes. In many cases, however, after the most careful examination, no cause can be ascertained ; such cases need symptomatic treatment. In many of the above conditions the diagnosis is greatly helped by an *x*-ray photograph.

The treatment of neuralgia may be dealt with under two heads : (A) *Local Treatment ;* (B) *General Treatment.* Under the former, the application of heat and cold, the local application of drugs, counter-irritants, electricity, hypodermic injection of drugs, and surgical treatment, will be considered ; under the latter, the administration of drugs, diet, massage, and change of climate.

A.—**Local Treatment.**—

1. *The Application of Heat* over the affected nerve, or the 'tender point', will often afford considerable relief. The application of heat by means of a hot-water bottle is simple and often effective. The heat produced by the electric current in an electrotherm is easy of application, and the temperature can be regulated and maintained at a constant level for any length of time desired. After removal of the hot application the part should be covered with dry wool.

Cases of brachial neuralgia are best treated by a hot-air bath in which the required temperature is attained by means of an electric current—a temperature of 300° to 400° F. may be used. After the bath, the arm should be carefully and firmly bound up in a flannel bandage, and kept at absolute rest by means of a sling. Cold may be applied by means of an ice-bag, or by the spray of ether or ethyl chloride, but is seldom so serviceable as heat in the relief of neuralgia.

2. *Local Application of Drugs.*—Drugs may be applied locally, either on account of their sedative action, or to act as counter-irritants. Into the former category would come such remedies as belladonna, aconite, and opium, whilst in the latter may be mentioned turpentine, mustard, chloroform, camphor, oil of wintergreen, iodine, mesotan. Mesotan should be diluted with equal parts of olive oil and be painted over the affected part, but should not be rubbed in, as in certain individuals it gives rise to considerable irritation of the skin.

3. *Counter-irritants.*—The application of two or more leeches is a most valuable remedy in acute attacks of neuralgia, but is of less service when the symptoms recur with comparative frequency. In these cases a blister is more useful ; such may be produced by the application of the ordinary liq. epispasticus or collodium vesicans, or by the application of the actual cautery. For intercostal neuralgia the cautery is to be preferred, two small strokes being made on one or other side of the spine, and the application repeated on a fresh place every other day.

4. *Electricity.*—Faradism, galvanism, diathermy, high-frequency, static, and sinusoidal currents, and the vibration produced by the rapid revolution of a small motor have all had an extended trial. In individual cases some success has been attained by the use of the galvanic current. The positive pole should be applied to the tender spot, and a weak current, from 2 to 5 milliampères, allowed to pass for five to ten minutes. This should be repeated every day for fourteen days at least. In the case of brachial neuralgia, the current may be used in a bath. Ionic medication (kataphoresis) with iodide, sodium salicylate, etc., is of value in some cases (for details as to the application of this method reference should be made to ELECTROTHERAPEUTICS, *Ionic Medication*, p. 281).

5. *Hypodermic Injection of Drugs.*—The local hypodermic injection of drugs has been used in some cases. Cocaine in doses of $\frac{1}{8}$ to $\frac{1}{4}$ gr. may be of some service, but seldom gives the marked relief afforded by injections of morphia. On the other hand, the probability of producing a morphia or cocaine habit is equally great with either drug, and this should be borne in mind when recommending this form of treatment. The injection of the trigeminal nerve and Gasserian ganglion with 90 per cent alcohol is one of the most successful methods of dealing with cases of trigeminal neuralgia (tic douloureux). The

injection of the second and third divisions is not difficult. The injection of the first division, owing to the proximity of the optic nerve, is attended by some risk. The injection of the Gasserian ganglion is a difficult procedure and is not always possible, owing to the variations in the position of the foramen ovale ; if it can be successfully accomplished it is attended by good results—especially if no damage is done to the first division, so that the sensation of the cornea is preserved.

The injection of the third division and Gasserian ganglion is performed by inserting a needle (8 cm. by 1·25 mm.) into the ovale area, bounded above by the lower border of the zygoma and below by the incisor notch of the lower jaw, at a spot 1 inch in front of the anterior wall of the meatus. The nerve should be punctured at a depth of 4·5 cm., but this varies slightly in different individuals. The injection can be done either under a general anæsthetic, or under morphia ($\frac{1}{3}$ gr.) and hyoscine ($\frac{1}{150}$ gr.) with a local injection of 0·5 c.c. of a solution of 5 per cent novocain—$1\frac{1}{2}$ to 2 c.c. of alcohol being injected into the nerve. The advantage of performing the injection under hyoscine and morphia anæsthesia is that the amount of anæsthesia produced can be limited to the second and third divisions of the nerve, whereas under a general anæsthetic this cannot be determined. The disadvantage of the hyoscine-morphia method is that some pain is caused, and this in a nervous patient may make the operation difficult. Repeated injections may be required before the pain is completely abolished, and the cure is not always lasting. For a detailed description of the method, reference should be made to Dr. Harris's paper (*Lancet*, 1912, i, 218, and 1913, i, 881).

6. *Surgical Treatment.*—Nerve section or stretching may afford temporary or permanent relief when the pain lies within the territory of the branch of one nerve. In severe trigeminal neuralgia the removal of the Gasserian ganglion affords permanent relief in cases in which all other remedies, medical or surgical, have failed. This operation is ot to be lightly undertaken, for it is attended with an appreciable mortality. In brachial and intercostal neuralgia the division of the posterior root, or excision of the posterior root ganglion, may afford relief.

B.—**General Treatment.**—

1. *Drugs.*—Many of the milder forms of neuralgia yield to simple medical treatment. The administration of iron, arsenic, strychnine, quinine, and cod-liver oil, by improving the general health, cures the anæmia and removes the neuralgia. In other cases, sodium salicylate, salicin, and acetylsalicylic acid (aspirin), in 5- to 10-gr. doses three times a day, are of service. When there is reason for believing that malaria, syphilis, or gout is a determining factor, large doses of quinine, or iodide of potassium respectively, or anti-gout remedies, are indicated. Strychnine administered hypodermically, commencing with a dose of $\frac{1}{60}$ gr. each morning, the dose being gradually increased up to $\frac{1}{15}$ gr., is sometimes of great benefit. For the immediate relief of the more severe paroxysms, phenacetin, phenazone, acetanilide, or butyl-chloral may be given.

Other drugs, such as caffeine, aluminium chloride, belladonna, valerian, and phosphorus should also be given a trial. Gelsemium, in doses of 10 to 15 min. of the tincture, every four hours, is often successful, the quantity being gradually increased until the pain is relieved or toxic symptoms are produced.

2. *Diet.*—This should be carefully attended to, but no one form is applicable in all cases. In patients who are thin and pale a generous diet may be advised, milk, cream, and butter being important elements. In those who show a tendency to gout or rheumatism, a modified diet suitable for such conditions should be ordered. With the object of improving the general health, alcohol may be given, but the resort to alcohol for the relief of pain should be carefully guarded against.

3. *Massage.*—Carefully regulated exercises, short of fatigue, in the fresh air are most beneficial, and the health may be greatly improved by general massage. Local massage to the affected part may be used in long-standing cases, but in the acute cases it often increases the pain.

4. *Change of Climate.*—A warm dry climate is most beneficial, and cases which have for a long time hung fire, rapidly improve and get well when placed under such conditions. Various forms of warm, salt, and mud baths may be used.

Shortly, it may be said that the treatment of neuralgia should be directed to (1) Improvement of the general health and removal of any source of possible irritation ; and

(2) The relief of pain by the application of heat, counter-irritants, electricity, drugs, and, in true cases of trigeminal neuralgia, by the injection of 90 per cent alcohol into the trunk of the nerve or Gasserian ganglion. Failing a successful result from these remedies, nerve section and removal of the Gasserian ganglion should be advised. (*See also* ELECTROTHERAPEUTICS and NEURALGIA, EPILEPTIFORM.)

F. E. Batten.
(*Revised by Edwin Bramwell.*)

NEURALGIA, EPILEPTIFORM (**Tic Douloureux, Major Neuralgia**).—This disease must be distinguished from the minor neuralgias common in the face. It is a disease which attacks adults and appears without apparent cause. The sufferers are, as a rule, in perfect health, and are not the subjects of neurotic inheritance. The disease usually manifests itself in the distribution of the second or third division of the nerve; the first, so frequently affected in minor neuralgias, usually escapes or is involved late. The attacks of pain are paroxysmal, and occur at first at long intervals, but the severity of the pain tends to increase and the intervals between the attacks to diminish. The pain usually spreads in a definite order, branch after branch becoming involved in a regular march. As time goes on the paroxysms of pain are excited by any stimulus, so that eating, speaking, or a loud noise may be sufficient to start an attack. As a rule, before the patient comes under the care of the surgeon, teeth will have been extracted, and all drugs, except perhaps morphia, employed; the latter is the only means of combating the pain, short of surgical measures. The severity of the disease is such that suicide or the morphia habit is the end of those patients who are not surgically treated; the disease does not cease spontaneously, and medical treatment is of no avail.

This is the disease to which the following treatment refers. It must be first settled that the case belongs to this group. When the condition has existed for some time there can be no mistake; the appearance of the patient, together with the history, leaves no doubt that we are dealing with a case of true trigeminal neuralgia. In the milder instances this may not be so easy; but the onset of the disease without apparent cause, the absence of anæsthesia such as is met with in cases in which the nerve is pressed upon by growth, and the absence of all exciting causes in the teeth, jaws, and sinuses, should lead to the correct diagnosis.

TREATMENT.—It is now established that operation on the Gasserian ganglion or its sensory root is the only treatment that can be relied upon to cure.

The injection of alcohol will, however, in many cases relieve the pain for nine or ten months, and may be given a trial. It should be followed by loss of sensation in the territory supplied by the branch or branches affected—if injection fails to relieve, operation should be carried out. Considerable practice is necessary if success is to be obtained. A stout needle, 10 cm. long and 1·5 mm. in diameter, fitted with a blunt stylet and marked in centimetres up to five, is used. As a rule a general anæsthetic is not necessary. When the point of the needle is through the skin the stylet is pushed in. When the end of the needle has reached the proper depth, the stylet is withdrawn and a glass syringe filled with solution fitted to the needle, and the injection made.

When the pain is in the area of the second division of the nerve, the injection is made into and around the nerve as it emerges from the foramen rotundum. The needle is inserted at the lower border of the zygoma, ½ cm. posterior to a line drawn downwards from the posterior border of the orbital process of the malar bone. It should be directed inwards and slightly upwards for about 5 cm. To inject the third division, the needle is inserted at the lower border of the zygoma, 2½ cm. in front of its descending root. Its direction is backwards and upwards till the external pterygoid plate is reached, then upwards and backwards to the foramen ovale. This is usually reached at a depth of 4 cm. When operation is decided upon, Hutchinson's, in which the ophthalmic division is spared, should be carried out by the temporal route. The results of this procedure are so good that no other need be discussed.

The mortality in skilled hands is extremely small, and will compare favourably with any major operation. Mr. Hutchinson has operated on 70 cases with a death-rate of 4 per cent; the late Sir Victor Horsley on 149 with a death-rate of 7 per cent, but no patient under fifty years of age died; Cushing on 156 with 2 deaths. (*See* NERVES, PERIPHERAL.)

James Sherren.

NEURASTHENIA.—Before neurasthenia is diagnosed a very careful examination must be made, for the similarity in symptomatology between it and organic diseases is close, more so than in hysteria. There is, moreover, this difficulty: a number of organic cases have neurasthenic symptoms added to those proper to the physical condition, and every patient severely ill from neurasthenia has some symptoms which are due, not to his functional condition, but to organic physical states. The position is therefore complicated, and needs simplification.

For information on the pathogeny, method of case-taking, and examination, see the article on HYSTERIA, which should be read before any further perusal of this.

With regard to the statement which is to be made by the doctor to the patient, it cannot be too strongly insisted on that an accurate impression of the condition must be conveyed: an immense amount of harm can be done by want of clearness. Opinions such as 'weak heart but not diseased', 'weak lungs', are great creators and preservers of neurasthenia. They are expressions which are devoid of meaning to the doctor himself, and therefore to the patient they convey only doubt and anxiety, and so increase the disease, which has its origin in doubt and anxiety.

As was shown in the discussion on the pathogeny, the patient is one who is exhausted in mind and body after a struggle against the difficulties of his environment. Two things are therefore needed: he must be rested and built up; he must be taught how to manage his life with less struggle.

Rest.—It need not be laid down that every case requires rest in bed, but all those which are advanced do. At the beginning this had best be absolute, except that the patient may rise to have a bath and to move the bowels and empty the bladder. The period of this rest should seldom exceed three or four weeks.

Mental as well as physical rest must be secured. No rule-of-thumb can be laid down for this. Some people can rest quite well in their own homes; others will accomplish their end better in a nursing home, away from all contact with friends and correspondence. There are those whom such a plan would depress, though it is also true that many think that they will not rest under these circumstances who enjoy it when they have tried it. Many women say that they could not rest away from their homes and children, though these may be the very things which are keeping their illness in being. As regards correspondence, a large amount is incompatible with rest; even a weekly home letter may be disturbing. Some patients, on the other other hand, will fail to get mental rest unless they receive a short line from home every day.

The doctor himself must be the judge of what is to be done; and once his decision is made and accepted he must adhere to it. He will be well advised, if he is a beginner at this kind of work, to insist on complete change from home and no letters at the outset of the treatment; he will himself keep in regular communication with the patient's home, and give a faithful report of the health of its inmates. As he grows more experienced he will learn where he may safely relax the rules. The duration of the mental rest will roughly coincide with the physical. In both, the return to activity should be gradual.

Reading may be allowed from the outset. The daily paper may usually be permitted: books at the beginning should be unemotional and not requiring much concentration.

Building-up.—It was stated that these patients usually have anorexia and dyspepsia, and that they have become thin. Along with this a dilated atonic stomach is common. The horizontal position allows an atonic stomach to perform its motor functions more easily, and improved appetite and better digestion follow. Because the stomach is in an atonic condition, the diet must at first be small in amount and simple in character, and full diet be achieved only gradually.

Until recently it has been customary to order massage to patients who are kept in bed and fed in this manner. This measure was advised by Weir Mitchell, who pointed out that a patient kept in bed was like a limb kept in a splint. The fractured bone, he said, might be mended at the end of some weeks, but the limb was diseased. It seems likely that he did actually keep his patients like a limb in a splint; apparently he did not allow them to rise at all, hardly to turn in bed. This is quite unnecessary. Under such a régime massage as a corrective was indicated. But there is no objection to letting the patient up for necessary purposes, none to letting him sit up in bed for meals, and none to letting him employ himself with light work, such as knitting, toy-making, etc. The

rest advised here is not a psychical but a physical measure, and no tired person is worse for a little movement. So great was Weir Mitchell's success that for many years anything he said about these patients was considered absolute truth, and as he said massage was essential, essential it was held to be. In time it was even looked on as a remedy for neurasthenia, whereas he never put it forward as anything but a corrective for the rest-cure. Massage is not an essential but a luxury in the treatment of neurasthenia. For reasons not so clear Weir Mitchell also advised electricity. There is no rational basis for its employment, and if it is used its effect is purely moral.

Re-education in Management of Life.—From the outset psychotherapy is being practised. The method of case-taking already described, in addition to its being essential for diagnosis, is a psychotherapeutic measure of importance: day by day other measures are employed. At first it is best that these should have reference to the symptoms only, and among the first symptoms which will need attention are the digestive. The patient may say that he cannot be expected to eat if he is kept in bed. He is shown how bed favours the action of a feeble stomach; he is informed that people with fractures who are necessarily confined to bed are, as a rule, able to eat as much as when they were up and about. He will give a list of foods which he cannot possibly touch, and here his ideas may be successfully attacked from two sides. First he can be shown that the list of foods which he can and cannot take have no real relation to their digestibility. In his forbidden list will be found things more easily digested than in his approved list. Secondly, from his history it will be seen that his dyspepsia began and got worse at periods of mental stress. He should be told that it is known that anxiety alters the gastric secretion and delays the motor action, and that there was therefore a real dyspepsia due neither to the food he had eaten nor to the state of the stomach, but to his mental state alone. He will probably then be easily persuaded to see that he made the error of ascribing his symptoms to a particular class of food, and that if he had to eat that kind, he did so in a condition of anxiety, and that this secondary anxiety was then the cause of further dyspepsia. When this had gone on long enough there were almost no foods that he could eat without anxiety, and therefore his dyspepsia became fixed. This was then followed by chronic lowering of stomach tone—physical weakness was superadded. He must now be led back along this road. He is shown that the atonic stomach works best in bed. This gives confidence, and he will therefore eat in hope and not in despair. He is promised that the food will be carefully regulated, that at first only small amounts will be given, and this of a simple nature, that day by day this will be added to in accordance with a well-tried plan. All this regularity and method replacing his own chaotic gropings will inspire confidence, and with that the battle is half won. The following plan is not to be regarded as a rigid scheme, but as an indication. The details must be worked out for each individual. If milk is available, it is convenient to start with about half a pint and a small slice of bread and butter every three hours the first day, every two hours the second; a larger piece of bread and butter is added the third, an egg the fourth, a milk pudding at midday the fifth; then fish, fowl, meat in succession, till at the end of ten days the patient is having the ordinary full meals with $2\frac{1}{2}$ to 3 pints of milk, some of which is taken with the meals, and some half-way between them. The patient should be brought up to about his normal weight; there is no object gained by making him fat. Though milk is of great assistance, it is not essential; any ordinary diet will do, provided the patient is induced to see that all the ordinary foods of a household are digestible if only he will believe it. It is not wise to introduce any of the special advertised foods: if success follows, it is a misfortune for the future; the patient will believe that it was the food and not his altered state of mind that caused the improvement, and his dependence on himself will be assured by so much the less.

Another symptom which usually needs early help is insomnia. Nearly all neurasthenic patients sleep badly, and the condition is one provocative of alarm. Most consider that if it continues they will lose their reason, or damage their brains in some irretrievable way. The patient should be told that these fears are groundless, that bad sleep is depressing but not dangerous. It may be pointed out that interest of any kind tends to keep people awake. Brain workers with a large output sit up late, and the interest of their work keeps them awake till one, two, or three in the morning. They do not call this insomnia, and they do not feel ill because of it; rather they congratulate

themselves that they can do with so little sleep. So with pleasure-seekers who will stay up dancing night after night and certainly not feel that they are losing their reason: the interest of their pleasure keeps them awake, and it is only when this pleasure begins to pall that they begin to feel tired. Now worries and anxieties are kinds of interest; they are not of a desirable kind, but they are interests, in oneself instead of in something objective. When they keep people awake the condition is now called insomnia, and all sorts of evil results are feared. But the actual being awake can be no more harmful in the one set of cases than in the other; and the reason why the one set feel ill next day and the other not, is not because of the want of sleep but because of the accompanying anxieties, which the patient has already learnt are the cause of his symptoms. It will be found that the commonest anxiety is about the effect of want of sleep itself; and if some explanation like the above is given, three-fourths of the patients will immediately begin to sleep well. No promise, however, that this will happen should be given; the patient should be promised that he will be able to lie quietly in his bed, and not feel so ill after a poor night. Those to whom such an explanation does not bring sleep will be found to be suffering from some other anxiety, to be dealt with in the manner shown below.

Hypnotic drugs are therefore hardly ever called for in the treatment of neurasthenic insomnia, and if they are employed the doctor should feel that he has to some extent failed in his task. If he is driven to them it is advised that they be administered as follows: A cachet with an effective dose, say ten grains of veronal, is given. Next night, nine grains plus one grain of inert substance; next, eight of the drug and two of the other, and so on till a few nights of sleep have been obtained without the drug at all. No deception is practised; the patient is told that some such plan will be employed, but that he will not know what nights he gets the drug and what nights he does not. When two or three nights without any drug have passed, he is told that this has happened, and he will himself see that his want of sleep depended on anxiety about sleep. On no account should drugs like chloral or opium be administered. Bromides are useless for promoting sleep. Veronal and its modifications are the most suitable for these patients. (*See also* INSOMNIA.)

The fear of insanity depends not only on poor sleep, but on the mental disabilities: the lack of concentration, the acts of forgetfulness, the various fears which beset these patients. As he is engaged in continuous struggle it is small wonder that he cannot concentrate on anything beside this struggle; as he does not concentrate on his daily affairs, he is forgetful; as he is in constant dread of the future, he has fears. They all depend on the presence of some anterior symptom, and when he has learned how to deal with this they will disappear: in the meantime he can be assured that this is not the way people lose their reason. There are certain specific fears, such as those of the street, of closed rooms, of people, of trains, which will require to be dealt with separately.

About the other general symptoms similar assurances must be made. It must be shown that palpitation will occur in a healthy heart on emotion, that after this has occurred several times nervous people will begin to be anxious about their hearts and dread heart disease, and that this fear is sufficient to keep the palpitation in being. So with polyuria, headache, and the other symptoms.

The psychotherapy so far has dealt only with the persistence of symptoms and not with their origins, and lasting cure demands that this should be laid bare. It has also dealt only with certain symptoms which are of a secondary nature. Certain others which may be called primary, such as the specific phobias mentioned above, it has not touched. No persuasion will make the slightest difference to the condition of a man who finds it impossible to travel alone in a railway carriage. He is not dreading an accident, or an assault, or anything else that is mentioned. The fear is there apparently as a primary thing, and its beginning must be found. All his secondary symptoms may have disappeared as the result of the above treatment, but he is really no whit fitter for the battle of life if this disability remains.

In many instances the origin may be found by tracing the symptoms back in the way described in the article on hysteria. As the mass of symptoms is reduced by psychotherapy, some will be found uninfluenced, and these should now be investigated. Thus a certain patient was always uncomfortable in company, so that he was never able to enjoy ordinary social intercourse. He also dreaded some serious disease of his kidneys

and no amount of reassurance by many doctors had been able to undermine this. It was found that the latter fear was connected with the fact that he had somewhat puffy eyelids; he had learned from one doctor that that sometimes indicated renal disease. But he had invariably been unable to get comfort from the findings in the urine. By going further back it was discovered that at the age of fifteen he had been told that his eyes showed that he practised masturbation. It was true that he did so, and he was therefore prepared to believe that the facial sign was indeed pathognomonic, and as he did not see many eyes like his own, he naturally concluded that he was doing this certainly in excess of what other boys did. As he did not know how common the knowledge of this sign was, he naturally became shy in company, and this persisted. He thought his debased character was stamped on his face. He had, however, struggled to keep about, and the constant effort and anxiety had exhausted him. It was easy to show him that the sign was false, and to get him to believe that all people are subject to sexual thought, and that most boys masturbate. He then became well. It may be noted that the fear of kidney trouble was a more tolerable thought than the other, and therefore was not easily parted with.

By pushing the conversation back over the years, many difficulties will be brought to the surface, and in almost all the doctor will be able to make the patient see that there is a better way of looking at them than that hitherto practised. These people are over-scrupulous and have been calling themselves cowardly, vicious, untruthful, greedy, and selfish, when they have only been thinking what we all sometimes think, and practising what we all sometimes practise. It will not be difficult to show them that we all have thoughts of which we are ashamed, and that often we have yielded to them, but that surprisingly often we and they have overcome them, and that when we have overcome them we may be proud; for shameful thoughts are temptations, and there can be no virtue, but only innocence, a pretty but a valueless thing, in the absence of temptation. The doctor need not fear that he will be guilty of cant if he speaks like this; he will get no opportunity to do so till he is far into the patient's confidence, and it will then be the natural and obvious thing to do. When this has been done the primary symptoms will disappear, and the patient will have acquired such insight into his condition that relapse need not be contemplated.

As in hysteria, the causal ideas may be fully in consciousness, outside the focus of attention, but brought there fairly easily, or they may have been pushed wholly out of consciousness and be incapable of recall by ordinary thinking. Even in the last case careful thinking back may bring them to the surface. If they cannot be brought back the Freudian technique may be employed, but, as stated in the article on hysteria, it is a dangerous weapon.

As soon as it can be managed, the patient should be engaged in some regular occupation. This may be started while he is still in bed, and certainly should be part of his daily life as soon as he begins to get up. He has lost confidence in the power of accomplishing anything, and he will regain this nowhere so easily as under the superintendence of the doctor whom he has learned to trust. If he has any special aptitude, that should be encouraged; if he can draw or paint, let him do these. If he has no aptitude, let him be encouraged to try something. In an institution it is easy to provide a variety of work, such as carpentry, book-binding, weaving, etc. In private a little ingenuity will discover something. The work should be useful when possible, so that the patient may feel once again that he is doing something to help on the work of the world. He must expect that at first it will be difficult and discouraging; this we all feel at times, even when we are well; and therefore he must not look on it as something which is a sign that he is not yet fit to begin. He must persevere even on those days in which he feels it very hard.

In the foregoing scheme of treatment no medicinal cure for neurasthenia has been advocated, and if the etiology of the disease be what has been described, there can be no medicinal cure. It is not denied that patients have got well after medicinal treatment, but it cannot have acted in virtue of the chemical substances employed. The illness is one which is kept in being by despair; a medicine, especially if it be new or in the fashion, may aid greatly by instilling hope, or it may be that the doctor by his kindness and care has inspired hope, and then his medicines will work wonders. But the method by which neurasthenia is cured is not a matter of indifference. The sufferer is one who has failed

to react normally and easily to the anxieties of life, and it should be the doctor's duty to point out how he has failed and why he need not do so again. If a patient has been cured by medicine he will not readily believe that it was his method of reaction that made him ill, he will not trouble to understand how he is to meet the next strain, and therefore he will break down again sooner than if he had been cured by psychotherapy.

At the same time one need not be fanatical about the use of drugs. For example, in civilized sedentary life many people need a small daily aperient, unless they are to suffer discomfort. So long as the dose remains small no interference with this habit is called for. It is when patients get out of hand in the matter, when they begin to take constantly-increasing doses, when, in short, they get the matter on their minds, that psychotherapy is called for. Here again the doctor must exercise common sense. He should explain early in the course of treatment why he is not going to use drugs. If he waits till the patient has asked for them and then refuses, the latter will be apt to think that they were overlooked and will not accept the refusal with alacrity.

It is difficult to treat uneducated patients without drugs. They have considerable difficulty in grasping the idea of an illness due to thought, and if they get no drugs they are prone to say that they are getting no treatment. In their case, too, the simple psychotherapy which they are capable of receiving is not nullified by the use of drugs as it is in the case of the educated. The latter see a contradiction in a patient with a moral illness receiving a medicine, the former do not. For these reasons a bottle of medicine is desirable for them. But the doctor need not be too hasty in concluding that the patient belongs to this class. He has in the course of the investigation, which cannot be concluded in one day, plenty of opportunity to test the mentality of the patient, and he would do well to give the benefit of doubt in the direction of believing that the patient in hand will prove to be understanding.

Finally, it may be pointed out that the development of a neurasthenic attack is largely in the doctor's hands. The doctor who listens carefully and alone to his patient's story—for they will not tell all in public—who is careful in his physical examinations, who does not fear to report exactly what he finds, and who possesses judgement so that he is not led away by every fantastic whim of medical fashion, will have few neurasthenics in his practice. He cannot escape them altogether, but they will not grow into the helpless and hopeless beings that are the bane of everyone's existence who comes into contact with them. (*See also* PSYCHONEUROSES.)

T. A. Ross.

NEURITIS.—Under this term many conditions have been included which differ markedly, not only in their clinical manifestations and pathology, but also in their treatment. The following principles may be laid down as applicable to the treatment of the disease in general.

1. *Removal of the Cause*, whether due to metallic, organic, or other forms of poison. Workers in lead, painters, artists, should give up their work, or take precautions to prevent the metal entering the system. Possible poisoning by lead or arsenic taken as a drug or in beer, must be borne in mind. Arsenical neuritis is sometimes met with in cases of pernicious anæmia or chorea, in which diseases the drug is often used. Chronic discharges should be treated, infected wounds attended to, and infected teeth removed. A local neuritis may be due to pressure by a cervical rib or callus in association with a fracture.

2. *Rest.*—This is of the first importance ; in most cases the patient should be kept in bed, but in cases of a localized neuritis, rest to the affected part may be sufficient. Thus, in cases of brachial neuritis the elbow should be supported in a sling with the object of relieving tension on the nerve.

3. *Diet.*—The use of alcohol in any form should be prohibited. A full and generous diet is in most cases advisable, but in gouty, diabetic, and rheumatic neuritis a diet suited to these conditions should be advised.

4. *Massage, Baths, and Electricity.*—These remedies should not be used during the acute stage, but later they are most valuable in promoting and restoring the function of the muscles.

Passing from such general considerations, the treatment of peripheral neuritis due to alcohol and metallic poisons may be taken as an example, and will be considered in detail.

Since, however, the treatment varies with the course of the disease, it will be dealt with under three headings, according to the stage of the disease.

1*st Stage.*—Cases seen and recognized early, when there are pain and tenderness of the muscles with but little loss of power, and the reflexes are still present if not actually exaggerated, generally respond well to treatment. This should consist in placing the patient at rest in bed, diet being carefully regulated, and alcohol in any form absolutely excluded. It is especially important to see that these patients take their food well, and have what they like and can digest, for it not infrequently happens that by cutting off alcohol they lose their desire for food, and under such depressing conditions no improvement can be looked for. The administration of strychnine with some diluted phosphoric acid will often be sufficient to stimulate the appetite again, but in other cases some tincture of capsicum in an alkaline mixture with a small amount of sodium bromide seems to act better. It is advisable also to give the patient a small dose of calomel ($\frac{1}{6}$ gr.), or blue pill, at bedtime. Sleeplessness is best treated by one of the salts of bromine, but paraldehyde, amylene hydrate, chloral formamide, barbitone, methylsulphonal, or chloral may be given if necessary. Paraldehyde and amylene hydrate are best given in capsules. Chloral formamide should be given with spiritus ætheris nitrosi in a dilute acid mixture; it is incompatible with alkali. It will be found that early cases rapidly respond to this form of treatment, and after a few days' rest in bed, gentle massage and exercise are beneficial. These patients, however, usually require prolonged supervision. They do well under the routine of hydropathic treatment, and the regulated mode of life ensured in such institutions is most beneficial.

2*nd Stage.*—In this stage there is considerable loss of power in the muscles, with very marked tenderness not only of the muscles but also of the nerve-trunks, blunting of sensations over the peripheral portion of the limbs, and changes in the vasomotor condition of the skin: the patient should be kept absolutely at rest (preferably on a water bed), not only on account of the condition of the limbs, but also because of the liability to sudden syncope. He should not be allowed to sit up or strain at stool. The limbs should be wrapped in cotton-wool, and for the relief of pain hot fomentations or dry heat may be applied. During this stage also, the prohibition of alcohol should be made absolute, and other cardiac stimulants, strychnine, digitalis, and carbonate of ammonia, should be used to combat the depression which the withdrawal of alcohol is certain to produce. The legs should be placed on splints as soon as the acutest stage of the disease is over, in order to diminish as far as possible the tendency to muscle contraction; this can be most conveniently accomplished by a well-padded leather splint with foot-piece at right angles, kept in that position by two elastic springs, by a board placed at the bottom of the bed, against which the sole of the foot presses, or by a celluloid splint moulded to fit the limb. Diet is of the utmost importance, and great care has to be exercised in selecting suitable articles of food and such as are easy of digestion; for vomiting not infrequently occurs, and may be attended with considerable prostration. In persistent vomiting, it may be necessary to have recourse to rectal feeding. Massage and passive movements are now not only useless, but give rise to great pain and discomfort, and should not be employed. It is difficult to say exactly when massage may be begun, but as a rule when gentle pressure on the calf muscle can be borne, it is safe to begin a modified massage. Two to three weeks of complete rest may in some cases be sufficient, but a longer period is usually required. With regard to drugs, few are of much service, except those above mentioned, to which bromide may be added. Morphia may be necessary to relieve pain, but omnopon is very effective in some cases.

3*rd Stage.*—In this stage of the disease, when there is marked wasting of the muscles, often with considerable contraction, massage, active and passive movements, and electricity in its various forms, should be employed. It is important in this stage also that the limb should be placed in a splint, so that the paralyzed muscle may be kept at rest and deformity prevented; and for this purpose a light celluloid splint moulded to fit the limb is very suitable. If the muscles no longer respond to faradic stimulation, or respond very feebly, a galvanic current is the most suitable application, and may be made direct to the skin or by means of a bath. If considerable contraction of muscle has taken place, tenotomy may be necessary, but it is surprising how much relaxation can eventually be obtained by the use of hot-air baths and passive movements.

In exceptional cases of peripheral neuritis in which there is loss of the sense of position to a considerable degree—so-called 'neuro-tabes'—the use of Fraenkel's exercise board is of great service in re-educating the muscles in the exact performance of their work; and similarly, the use of a cribbage or solitaire board for the hands is of great educational value.

The outlines of treatment above indicated are applicable to neuritis due to metallic poisons, such as arsenic and lead, but it is important in these cases to supplement the treatment by drugs. It is generally held that iodide helps the elimination of lead from the body, and hence this drug is often given. Cod-liver oil, malt, iron, and hæmoglobin are also valuable adjuncts in treatment.

Two of the most troublesome symptoms in neuritis are pain and sleeplessness. With regard to the former, much can be done by careful support of the limbs, cradling them so that the bedclothes do not come in contact with them, and by a water bed. In addition, it is often necessary to use such drugs as phenacetin, acetylsalicylic acid (aspirin), acetanilide, exalgin, and citrate of caffeine. When these remedies fail, omnopon may prove helpful. Morphia should if posible be avoided, but there is no doubt that it has more effect in diminishing pain than any other remedy.

In the treatment of sleeplessness, paraldehyde and amylene hydrate are useful drugs, and are to be preferred to chloral, barbitone, methylsulphonal, and sulphonal, especially at the period when there is danger of cardiac failure.

Apart from the general condition above described, neuritis may be, and often is, limited to a single nerve, such for instance as the ulnar or external popliteal, the former giving rise to wasting of the small muscles of the hand, the latter to a localized foot-drop. Such a neuritis may be due to a traumatic or local condition, or may occur in association with some general toxic condition, such as rheumatism, diabetes, or gout, and it is of special importance in these cases to search for the local cause. An ulnar neuritis may, for instance, become manifest many years after an old fracture of the elbow; or again, wasting of muscles and alteration of sensation in the distribution of the first dorsal root or of the ulnar nerve may develop in association with the presence of a cervical rib. The above instances are given to enforce the point that a local cause should always be most carefully sought for in cases of local paralysis. The general lines of treatment above laid down should be adopted in these cases. Rest and warmth are of the greatest importance. Massage should be applied locally, and the nutrition of the muscles maintained by faradism and galvanism. The local hot-air bath is also of service. (*See also* ELECTROTHERAPEUTICS.)

F. E. Batten.
(*Revised by Edwin Bramwell.*)

NEUROMATA.—Under the term neuromata, all nerve conditions which lead to tumour formation are included. They can be divided into the true and the false. A true neuroma is made up of nerve-cells and nerve-fibres; it is an extremely rare tumour, and in four out of the five authentic cases recorded was connected with the sympathetic system. The false neuromata can be divided, as suggested by Alexis Thomson, into the circumscribed and the diffuse, and again into the innocent and the malignant. The circumscribed include all forms of innocent tumour growing from the connective tissue of the nerve, the so-called neurofibroma, myxoma, and also the painful subcutaneous nodule.

The symptoms, when a nerve containing sensory fibres is involved, are those of a tender tumour, the pain on pressure being referred to the peripheral distribution of the nerve. Sensation and motion are as a rule little interfered with; if anæsthesia and muscular wasting are present, we should think at once of diffuse fibrosis of the nerve due to long-standing irritation, or of sarcoma.

The diagnosis rests on the discovery of a tumour in the course of a nerve, usually movable laterally, not in a longitudinal direction; in a mixed or sensory nerve it is usually tender; in the painful subcutaneous nodule the tumour originates around one of the terminal filaments of the nerve, and the diagnosis is made by the symptoms which correspond to its name.

The painful nodule should be excised, and the other tumours shelled out from the connective-tissue sheath of the nerve; this is rarely impossible; if it be, the tumour must be resected and the continuity of the nerve restored.

Under the heading of neuroma are also included the end bulbs formed on divided nerves. After amputations these may give rise to trouble. Their formation is physiological, and it is not until pressure or traction is brought to bear on them that they give rise to symptoms. Pain brings the patient under observation ; it is usually of a shooting character, and may be referred to the absent limb or be accompanied by muscular spasms. The bulb should be freed and excised as high as possible. If this fail to relieve the pain in long-standing cases, division of posterior roots should be performed.

Localized malignant neuromata belong to the group of sarcomata, and grow from the sheath of the nerve. Unlike the innocent tumours, they cause progressive interference with the functions of the nerve. They are met with most often in connection with the sciatic nerve or one of its primary branches, but are fortunately rare. Conservative treatment has been of little avail. If it is considered a suitable case in which to try this, a large extent of the nerve must be removed and its continuity restored by one of the methods previously mentioned. In the case of the sciatic, amputation is the best treatment.

Under the term diffuse neuroma are grouped the conditions known as multiform neuromata, molluscum fibrosum, plexiform neurofibromata, etc., and the secondary sarcomata which are liable to originate in them. Surgical interference in these cases should be entirely symptomatic, nothing being done unless individual masses are painful or in other ways interfering with the well-being of the patient. It has been repeatedly noticed that operative interference has been followed by increase in the size and number of the tumours.

James Sherren.

NIGHT TERRORS.—Bad dreams always indicate ill-health, which may be trivial and temporary, or serious and lasting. They should not be regarded merely as humorous consequences of over-eating.

Night terrors and nightmare differ only in the degree of intensity of the fears which they inspire. Stolid, unimaginative children may suffer from *nightmare*. They awake screaming, in consequence, but are little the worse next day. But neurotic children with active brains are afflicted by *night terrors* which haunt them during waking hours. Their dread of 'witch-ridden pillows'—dread which they often keep to themselves—may destroy their health of mind and body. Even when the nature of the frightful dream-hallucination is forgotten, its effects may remain. Possibly chronic nervous dyspepsia and a large proportion of functional neuroses are traceable to repeated but unsuspected night terrors. The classification of night terrors into 'idiopathic' and 'symptomatic' is artificial. All are probably symptomatic, in the sense that they are excited by local, dimly felt, external or internal impressions. All are idiopathic, in the sense that the interpretation of such impressions is entirely the dreamer's own.

Treatment.—Night terrors, being the result of dimly felt external or internal impressions upon a morbidly excitable brain, should be treated by correction or removal of exciting causes, and by endeavouring to quiet the emotional temperament of the child. In addition to bad atmosphere in the bedroom, and uncomfortable beds and heavy bedclothes, the chief exciting causes are adenoid vegetations, perhaps errors of refraction, and bodily pain of any kind. Many sufferers are undoubtedly rheumatic, and of the so-called gouty or uric acid diathesis ; many are subject to what has been called 'mucous disease', in which the bowels are constipated or relaxed, the motions contain excess of mucus, threadworms are often present, and complaint is made of abdominal pain or discomfort. In other cases, also, cyclical albuminuria is met, with all its curious vasomotor disturbances. In many, delirium caused by pyrexia accounts for terrifying visual hallucinations. All such conditions require treatment, but it must be remembered that neither one nor all of them constitute the whole cause. Removal of adenoids, scybala, intestinal mucus, and parasites, correction of refractive errors, antirheumatic remedies and tonics, will not in all cases provide a cure. Children who brood all day over the recollection of some frightful dream, are apt at night, as Charles Lamb expressed it, to " wake into sleep, and find the vision true ". The idea that they can be taught not to be afraid of darkness by exposing them to it, cannot be too strongly condemned. Yet many parents and guardians still persist in thinking that a neurotic child's plea for a night-light should be met with derision and scorn.

It is necessary to correct their morbid tendencies to gloat over terrors seen and unseen, to protect their active, sensitive brains from educational over-pressure, to shield them as far as possible from thoughts, words, sights, and deeds which are calculated to increase their emotional proclivities.

Treatment by Drugs.—Bromides are always essential. A dose of 5 to 10 gr. of bromide of potassium, an hour or so before bedtime, is often sufficient to secure a night's rest. Chloral hydrate, 2½ to 5 gr., may be added. Fright usually upsets digestion, gastric and intestinal, and indigestion of either kind excites night terrors. When it can be ascertained that chronic fear and dread complete the vicious circle, bromides, besides wholesome consolation, suitable diet, and drugs which aid digestion and elimination, are needed. Bromides may be combined with bismuth, gentian, rhubarb, castor-oil emulsion, in gastro-intestinal troubles; with ferri et ammonii citras in anæmia; with strophanthus, digitalis, citrate of caffeine, when cardiac stimulants are required; or with nux vomica and hypophosphites in emulsion of cod-liver oil in debility. In rheumatic cases, salicylate of quinine and acetylsalicylic acid (aspirin) in 5-gr. doses are valuable drugs. Quinine as a rule is not well borne by highly neurotic children; when given, it should be with hydrobromic acid.

In cases of mucous diarrhœa, citrate of potash often acts well, and is also useful when night terrors are associated with enuresis and the presence of concentrated, highly acid urine containing *B. coli* (*see* ENURESIS). *Leonard G. Guthrie.*

NIGHTMARE.—(*See also* NIGHT TERRORS.) A patient who suffers from recurrent nightmare should sleep on a hard mattress with few bedclothes, and should keep the feet warm either with bed-socks or a hot bottle. He should avoid lying on the back, if necessary by having recourse to some such device as tying an empty reel over the sacrum, and should eschew heavy suppers. If there be any tendency to constipation, 5 gr. of compound rhubarb pill should be taken at bedtime. If he wakes after the nightmare, he should get up and swallow half a tumblerful of hot water to which a teaspoonful of sal volatile has been added. *Robert Hutchison.*

NIPPLE, DISEASES OF THE.

Cracks, Fissures, Eczema.—These conditions occur mainly in patients with retracted or imperfectly developed nipples, and during the first lactation. They cause much pain, interfere with suckling, and may give rise to acute mastitis or abscess. If the nipples are retracted the child has difficulty in seizing and retaining them, and its repeated attempts to do so lead to excoriation of the epithelium.

TREATMENT.—During the later months of pregnancy careful attention must be paid to the cleanliness of the nipples. All dried secretion must be regularly removed, and the nipple washed with a weak alcoholic solution, or with eau de Cologne and water, in order to harden the epithelium. If the nipples are retracted, the patient should be taught to draw them out gently each day. This procedure will usually put matters right before lactation commences, but if it should fail, the best plan is to draw them out regularly with the exhausting pump. Care must be taken to see that the corsets do not irritate the nipples.

If cracks or fissures form, they should be treated at once, as the inflammation is liable to spread to the breast. One of the following applications should be used: (1) Equal parts of glycerin. ac. tannici and a solution of 1–20 of carbolic acid.; (2) Glycerin. borac. (3) Sol. 1–1000 biniod. merc. These should be washed off with warm water before the child next takes the breast.

If one nipple is sore, it should be rested for two or three days. If both are slightly sore, an attempt should be made to continue suckling. If both are severely affected suckling should be stopped; for three or four days the nurse should milk the breasts, so that their secretion be not arrested; if, however, after this, the nipples have not recovered the child must be weaned.

Obstinate fissures should be treated by the application of pure carbolic acid on a fine probe.

Paget's Disease of the Nipple.—This is a cancerous disease, and is secondary to a growth situated deeply in the breast tissue. The treatment is that of malignant disease

of the breast; the 'radical' operation described elsewhere (*see* BREAST TUMOURS) should always be performed. Less extensive operations involve a proportionately greater chance of recurrence. Caustics, ointments, and other local remedies are useless.

Crisp English.

NOMA.—(*See* STOMATITIS.)

NOSE, ABNORMALITIES OF.—(*See* SEPTUM NASI, ABNORMALITIES OF.)

NOSE, ACCESSORY SINUSES OF.

ACUTE SUPPURATION.

In cases of acute nasal catarrh, if suppuration in one of the accessory sinuses be suspected, prompt and energetic treatment should be carried out to hasten the cure and to minimize the risk of the affection becoming chronic. The patient should be confined to a warm room, kept in bed when possible, and treated as for a severe cold (*see* RHINITIS, ACUTE). Local pain may be relieved by the application of moist or dry heat to the affected area; hot steam inhalations are often useful, and aspirin may be given internally. Alcohol and tobacco must be prohibited.

If there are symptoms indicating the *retention of pus* in a sinus, measures must be adopted to reduce the swelling round the outlet of the cavity, and thus to obtain a free escape for the discharge. Small pledgets of wool soaked in a solution of cocaine and suprarenal extract are packed up into the nose as near as possible to the opening of the sinus. After five to ten minutes these pledgets are removed and others inserted still further in. By this means it is usually possible to reduce the swelling around the ostium of the sinus, when a free flow of discharge at once commences, with immediate relief. When this has been secured, an attempt should be made to keep up the astringent effect by frequently washing the nose with a warm alkaline solution to which a few drops of vaseline have been added. The nose should also be sprayed frequently with a 2 per cent solution of menthol in oil, or with a weak chloretone and adrenalin inhalant.

If these means fail, local blood-letting should be tried. Incisions should be made along the under surface of the middle turbinate and along the adjacent outer wall of the nose. These incisions are usually followed by free bleeding which relieves the congestion.

If, after applying cocaine, polypi or œdematous hypertrophies are seen in the middle meatus, they must be removed. Also, if the middle turbinate is greatly enlarged and pressing against the septum, it may be necessary to remove its anterior end, but this should never be done until other means have failed.

When once a free escape for the discharge has been obtained, the natural tendency of acute cases is to heal spontaneously, although the discharge may continue for some days or even weeks.

When there is a purulent discharge from a sinus, of recent origin, without any symptoms of retention, the treatment as for acute rhinitis should be pursued for a time, and when the patient's general condition allows he should be given a tonic and change of air. For how long it is wise to continue this treatment is a most difficult question, and depends largely upon the patient's circumstances, and also upon the sinuses which are affected. For example, if the antrum is affected, it is wiser to take active measures to evacuate the cavity far earlier than would be done if the frontal sinus were affected. It will therefore be convenient to discuss the treatment of each sinus separately.

Antrum.—If signs of suppuration in the antrum continue after acute nasal catarrh has passed off, it is safest to puncture the cavity and to wash it out. Spontaneous recovery may still take place; yet there is a certain, if small, risk of the disease becoming chronic, and the longer the pus is allowed to remain in contact with the delicate lining membrane of the antrum, the greater the chance of its being permanently damaged. On the other hand, puncture of the antrum is exceedingly simple, gives rise to little inconvenience at the time, and to no subsequent ill-effect. Pledgets of wool soaked in a solution of cocaine and suprarenal extract are packed under the inferior turbinate close against the outer wall of the inferior meatus. When the parts are anæsthetic, a small trocar and cannula, such as Lichtwitz's, is pushed through the thin antro-meatal septum, and the antrum irrigated through the cannula with warm boracic lotion. In recent cases one

washing is often sufficient to effect a cure, but the little operation may have to be repeated at intervals of one or two days if there is sign of re-accumulation of the discharge.

When antrum suppuration is due to *dental trouble*, the offending tooth should be immediately removed, and the antrum perforated through the tooth socket. The method is described in connection with chronic antral suppuration (q.v.). Irrigation is carried out with warm boracic lotion, and it is better to maintain the opening for a day or two by inserting a small tube until it is certain that all the discharge has ceased. The prognosis is exceedingly good: nearly all cases recover if treated properly and in time.

Frontal Sinus.—The treatment depends upon the nature and severity of the symptoms. If the patient has great pain, continuous or recurring daily, and so severe as to incapacitate him, when the means above described have definitely failed, external operation must be carried out. If at any time there is external swelling, redness or œdema, or a high temperature, or any sign of cerebral trouble, external operation is immediately necessary. If the pain and other symptoms are not very severe, the anterior end of the middle turbinate may be removed and the treatment continued with nasal sprays and lotions, rest and tonics. In the still milder cases, which are most commonly seen, in which the patient has a headache or feeling of severe discomfort for an hour or more every morning, followed and relieved by nasal discharge, expectant treatment should be adopted. The patient should be given a plentiful, nutritious diet, a strong tonic, such as iron and strychnine and later should be sent away for change of air. Any dry, warm, healthy place may be chosen, but a sea voyage, if it can be taken in comfort, is especially to be recommended.

Ethmoidal Cells and Sphenoidal Sinus.—The treatment of acute ethmoidal or sphenoidal suppuration is essentially similar to that of chronic (q.v.). If there is no immediate danger, the disease should be treated through the nose; if orbital, cerebral or other urgent complications are present, an external operation is necessary.

Chronic Suppuration.

Although it is convenient to describe the treatment of each sinus separately, it must be remembered that frequently many sinuses are simultaneously involved, and they must be treated as a whole rather than as a series of unconnected affections. The cure, even the diagnosis, of suppuration in one sinus often depends upon the recognition and treatment of suppuration in the others. The treatment is essentially surgical, and its objects are: (1) The removal of any intranasal disease, and especially the removal of any polypus or œdematous hypertrophy, so as to make a free approach to the nasal opening of the affected cavity; (2) The evacuation of the discharge and the cure of any pathological condition within the cavity, such as disease of the lining mucous membrane or bony wall of the sinus. When these means fail: (3) The provision of permanent free drainage or (4) The obliteration of the affected cavity. It need hardly be added that every means should be adopted to keep the patient in good general health. General treatment will not only expedite a cure, but will often render successful a smaller operation than would otherwise be necessary.

When many sinuses are affected, in the absence of any urgent symptom it is generally best to open the antrum first; then if pus still continues to come from the nose, the anterior ethmoidal cells should be attacked, and finally the frontal sinus or the posterior ethmoidal cells or sphenoidal sinus, as the symptoms indicate, should be explored. When there is extensive nasal polypus it is best to commence the treatment by performing a radical operation upon the ethmoidal region. As this requires general anæsthesia, the opportunity should be utilized of exploring the antrum, and of draining it if necessary.

Antrum, Maxillary.—If there are no indications of disease of the walls of the sinus one of the simpler methods should be first tried.

When *carious teeth are present*, and it seems probable that the suppuration is of dental origin, the suspected tooth should be removed and the antrum punctured through the socket. It is easiest to open the antrum through the inner socket of the first molar, but the operation may be performed through the socket of the second molar, of the second bicuspid, or even of the first bicuspid. Nitrous oxide anæsthesia is sufficient. The alveolar process is grasped by the left forefinger and thumb, and a small antrum drill is pushed upwards and inwards with a rotary motion until the floor of the antrum suddenly gives way. Care must be taken to avoid injury to the floor of the orbit, by having

guard upon the instrument or by steadying it with the tip of the right forefinger. The cavity is syringed out with a solution of boracic acid or other mild antiseptic lotion. If pus be found, the opening is kept patent by inserting a small silver tube, such as Ellis's spiral wire tube, or a dentist may make a special tube or plug and fix it to a neighbouring tooth. Twice daily the tube should be removed and boiled, the antrum syringed out with boracic lotion, and the tube replaced. As the discharge lessens it will be sufficient to syringe once a day, and if all goes well the intervals are gradually lengthened. If no pus is obtained after the syringing has been omitted for a week, the tube may be left out and the opening allowed to close.

If after careful treatment pus is still found in each washing, various other lotions may be used. Peroxide of hydrogen is one of the best; about two ounces should be introduced into the antrum and then quickly washed away with boracic lotion, as it gives rise to much smarting. A weak solution of sulphate or chloride of zinc or sulphate of copper (1 to 3 gr. of either to the ounce) may be used in a similar way. These last injections should not be repeated more than twice a week.

The prognosis is uncertain, but of cases of dental origin at least fifty per cent are cured, and the more recent the disease the more frequent and the more rapid the cure. In cases of nasal origin the prognosis is less favourable. If there is pus in each washing after three months, and certainly after six months' careful treatment, a cure cannot be anticipated. In these circumstances a radical operation may be recommended; but if a patient be averse to this he must continue the syringing, and may live comfortably for years with slight, if any, risk of complications.

When the teeth are sound or *the disease is obviously of nasal origin*, puncture through the inferior meatus of the nose should be performed. Pledgets of wool soaked in cocaine and adrenalin solution are packed in under the anterior end of the inferior turbinate and against the outer wall of the meatus. When the parts are anæsthetized, a small trocar, such as Lichtwitz's, is directed about half an inch behind the anterior end of the inferior turbinate, as high above the floor of the nose and as strongly outwards as possible, and pushed gently with a rotatory motion into the antrum. The trocar is withdrawn, and the cavity washed out through the cannula with boracic lotion. If pus be found, the operation may be repeated daily, or every other day. Prolonged treatment by this means is impossible, but three, four, or more punctures may be made before resorting to more severe measures. Most recent and a few chronic cases may be thus cured.

A radical operation is necessary when there is disease of the bony walls of the sinus, when there are polypi in the antrum, when it is impossible to syringe through the cavity owing to some obstruction of the natural ostium, or when the simpler measures above described have failed. Success depends upon establishing a large communication between the nose and the antrum, so as to secure permanent free drainage. The operation may be performed by making an incision in the canine fossa at the junction of the gum with the mucous membrane of the cheek, reflecting the periosteum, and chiselling a large opening through the outer wall of the antrum. The interior of the antrum is examined and any polypus or obvious disease removed. The next and most essential part of the operation is to remove the wall between the antrum and the inferior meatus, together with a portion of the anterior end or of the middle of the inferior turbinate. The opening in the canine fossa is allowed to close, and the after-treatment is conducted entirely through the nose. The patient is taught to wash out the antrum daily with a mild antiseptic lotion until all discharge ceases.

It is much better to carry out this operation entirely through the nose. The anterior third of the inferior turbinate is removed, a large opening is broken through the antro-meatal septum with burrs, and the fragments are removed with forceps and curette. The interior of the antrum can now be explored with the finger, and any polypus or other gross disease removed. The large opening thus made remains permanent, and after-treatment consists in daily syringing until all discharge has ceased.

The results of these operations are good. By the latter method a more speedy cure is obtained, there is less reaction, and the painful swelling of the cheek and other inconveniences attached to the operation through the mouth are avoided.

Frontal Sinus.—Intranasal treatment should be adopted in the first instance, with the object of establishing a free outlet for the discharge into the nose by clearing the way

to the lower end of the infundibulum. The anterior end of the middle turbinate and any polypus or other obstruction in the middle meatus should be removed. The anterior ethmoidal cells should be cut away under cocaine, or freely curetted under general anæsthesia. The case should now be left for a time, provided no urgent symptoms are present, and every means should be used to improve the patient's general health.

Occasionally, as the result of disease, a wide communication exists between the sinus and the nose, and a cannula may be passed up the frontonasal duct and the sinus irrigated. This is not an easy matter, and must always be carried out by one who is skilled in the work. No force must be used, as fatal damage may result. Daily treatment is necessary, and unfortunately the result is rarely successful.

When intranasal treatment fails, if the patient is simply suffering from the inconvenience of a little purulent discharge from the nose, he may be well advised to leave it alone, and the nose should be inspected from time to time, so as to prevent or remove any obstruction to the outflow of discharge. If, however, the patient is suffering from urgent symptoms or serious inconvenience, external operation must be considered. There may be severe and frequently recurring headaches, or the general health may suffer from excessive discharge or chronic septic absorption; there may be disease of the bony walls of the sinus, or an external fistula, when an external operation should be strongly advised. The object of operation is to obliterate the sinus, or to establish free permanent drainage into the nose. The former method leads to the most certain and speedy cure, but is liable to produce considerable deformity. The steps of the operation are briefly as follows:—

A curved incision is made in the line of the eyebrow from the supra-orbital notch, downwards and inwards, round the inner angle of the orbit. The periosteum is detached from the inferior wall of the sinus, and an opening is chiselled into it at a spot about the junction of the inner wall and roof of the orbit, immediately above the inner canthus. The mucous membrane is incised, the interior of the sinus inspected, and its extent gauged. If the sinus be large, the affection recent, with no sign of bone disease, and if the prevention of deformity be of importance, simple drainage may be resorted to. When the sinus is small it is best to obliterate it. Also when the disease is of long standing, when the bony walls are affected, or when other complication is present, obliteration should be recommended, even though the sinus be large.

When it is intended to drain the sinus, the opening into it should be enlarged sufficiently to enable the interior to be examined, and all gross lesions removed. The infundibulum is enlarged with burrs, and a large drainage tube is passed down from the sinus into the nose. This tube is removed daily and the sinus syringed. After ten days the tube is replaced by a silver tube or rubber plug shaped like a small tracheotomy cannula, which must be worn and the syringing continued until all discharge ceases.

Obliteration leads to a more rapid and certain cure. The skin incision is prolonged outwards to the outer limit of the sinus, and inwards and downwards well below the inner canthus, so as to give free access to the infundibulum. The periosteum is detached from the whole of the anterior and inferior walls of the sinus, and these walls are cut away with strong bone-cutting forceps. Great care must be taken to open up every recess, and then the entire mucous membrane is removed with curettes. The infundibulum is freely opened up, and the anterior ethmoidal cells exposed and curetted away. The skin wound is sutured, but an opening is left for a tube, which should be passed down the infundibulum and worn for three or four weeks, or until all discharge has ceased. The after-treatment consists in applying the usual dressings and in removing the tube or plug, and syringing the sinus once or twice daily, according to the amount of discharge.

When the sinus is large, the deformity resulting from the sinking in of the soft parts after obliteration may be greatly lessened by leaving a bridge of bone running from the inner to the outer side of the sinus in the line of the eyebrow. The chief danger of these external operations upon the frontal sinus is septic infection of the diplöe, leading to acute osteomyelitis of the frontal bone, an occurrence almost invariably fatal. The tendency to this affection is increased by leaving a bridge, or by closing the external wound too tightly. It must be combated by maintaining absolutely free drainage until all discharge has ceased. The deformity after healing has taken place may be largely remedied by undercutting the adherent scar and inserting a suitably shaped piece of cartilage obtained from the patient's own costal cartilage.

Ethmoidal Cells.—The treatment depends upon the number of cells affected, and upon whether external complications are present.

1. When one or two cells only are involved, a small operation under cocaine is sufficient. The anterior end of the middle turbinate is removed. The affected cells are located by probing, their walls broken into with a Hajek's hook and cut away with Grünwald's forceps. This little operation may be repeated if necessary, and gives good results in cases of limited disease.

2. When numerous cells are affected, and when there is extensive polypoid degeneration of the ethmoidal mucous membrane, it is better to give the patient a general anæsthetic and to curette thoroughly the whole of the ethmoidal region. The larger polypi being removed with forceps such as Luc's, the diseased mucous membrane and bone are thoroughly curetted with Meyer's ring knives until firm bone is reached. The greatest care must be taken to avoid injury to the cribriform plate, and for this reason the curette should never be directed upwards, but the cutting blade should always be turned outwards towards the orbit.

The operation is accompanied by free bleeding, and therefore must be performed under very light anæsthesia and with the patient lying on his side. If the hæmorrhage persists it may be necessary to pack the nose, but this should never be done unless absolutely necessary. The healing may require one to two months, but ultimately the whole upper part of the nose becomes lined by thin white membrane, and all discharge ceases.

3. When an ethmoidal cell is bulging into the orbit, when there is abscess or cellulitis of the orbit depending upon ethmoidal disease, or when an external fistula is present, it will be necessary to perform an external operation upon the ethmoidal cells. A curved incision is made around the inner angle of the orbit, commencing near the supra-orbital notch and terminating well below the inner canthus. The periosteum is reflected from the inner wall of the orbit, thus exposing the orbital plate of the ethmoid. The ethmoidal cells are opened by cutting away this plate with chisels, and are then systematically broken down and removed with curettes or cutting forceps. The wound should be sutured and drainage provided as described in the after-treatment of operations on the frontal sinus.

Sphenoidal Sinus.—This, in spite of its apparently inaccessible position, is commonly one of the easiest sinuses to treat. Unless the nose be unduly wide, as in atrophic rhinitis, it will be necessary to remove the whole of the middle turbinate. The patient should be seated in the usual rhinoscopic position, or he may lie on his side. Suprarenal extract should be applied to the parts half an hour before the operation. Under general anæsthesia (nitrous oxide is sufficient) a spokeshave is passed over the posterior end of the turbinate and drawn sharply forwards, usually bringing away the whole structure. A few days later the sphenoidal region of the nose is carefully packed with pledgets of wool soaked in cocaine and suprarenal extract, to enable a good view of the part to be obtained. Light general anæsthesia may be induced if desired. A probe with hooked end is passed into the sphenoidal sinus to ascertain its extent, and then the anterior wall is broken down with a Hajek's hook. When the opening has been sufficiently enlarged, a pair of sphenoidal sinus forceps are introduced and the whole of the anterior wall of the sinus is cut away. The interior is now inspected and any polypus removed, but the lining membrane should on no account be curetted. The subsequent treatment consists in irrigating the sinus with weak antiseptic lotions until a cure has taken place.

H. Lambert Lack.

NOSE, ATROPHIC OR PERFORATING ULCER OF THE SEPTUM OF.—(*See also* Rhinitis Sicca and Epistaxis.)—This ulcer usually occurs in connection with dry rhinitis, is situated on the anterior part of the septum, and unless treated early results in a perforation. Some three-fourths of the perforations of the cartilaginous septum result from this cause. The ulceration is due to the formation of crusts of dust and mucus on the septal mucous membrane, and the detachment of these crusts by forcibly blowing or by picking the nose. It is necessary, therefore, to prevent the crusts, and to warn the patient against picking the nose, a habit which soon becomes unconscious. The nose must be cleansed two or three times a day with a simple alkaline lotion, and the anterior part of the septum should be well smeared over with a mild antiseptic ointment—

such as weak boric acid or dilute nitrate of mercury ointment. Strong applications, such as caustics, do harm. In this way the ulceration may be encouraged to heal, but treatment must be steadily and persistently carried out or a relapse will occur.

H. Lambert Lack.

NOSE, FOREIGN BODIES IN.—Foreign bodies in the nose are most common in children, and comprise such small articles as boot buttons, fruit stones, fragments of wood, rubber, paper, and so on. Whenever a unilateral, purulent, fœtid nasal discharge is met with, the presence of a foreign body should be suspected, and the diagnosis completed by making an attempt to remove it.

The removal is best effected by means of a small blunt hook such as a strabismus hook, or a probe with its end bent at a right angle a quarter of an inch from the tip. The hook is gently passed through the middle meatus of the nose, over and beyond the foreign body, which almost always lies in the anterior third of the inferior meatus ; its point is then lowered on to the floor of the nose, and it is drawn gently forward. With care the hook can usually be placed in position without frightening or hurting the child, and then, even if the child draws backward, it only helps the removal of the foreign body. If this manœuvre is unsuccessful, or if the child is very frightened, a little chloroform may be given and the removal attempted in the same way. Forceps should never be used. It is very difficult to grasp a foreign body firmly without obtaining a good view of it, and owing to the purulent discharge and swelling in the nose it is generally impossible to get a good view ; thus the forceps are apt to slip off and push the foreign body further in. Attempts to remove a foreign body by syringing are dangerous, as much force is often required and the fluid is apt to be driven into the Eustachian tubes and cause acute otitis.

Rhinoliths, or nasal stones, may occur in children or adults, and give rise to symptoms similar to those caused by foreign bodies. Their treatment is essentially the same, but if the stone is very large it may be necessary to crush it or to cut off pieces before it can be extracted.

H. Lambert Lack.

NOSE, FRACTURES OF.—Fractures of the nose result from severe direct violence, such as falls in which the nose comes in contact with a hard substance, or violent blows. The injury may be limited to the cartilaginous portions, the cartilaginous framework may be separated from the bony framework, or the strong nasal bones themselves may be broken. In addition to the external deformity, the nasal septum will be more or less crumpled. When first seen, the depression of the nasal bridge may be partly concealed by inflammatory swelling ; thus the ultimate result may show greater deformity than was suspected.

If seen early, the parts should be replaced in position as accurately as possible by manipulation with the fingers outside, and a pair of blunt forceps inside, the nose. The septum also should be replaced in position. To lessen the pain of these procedures the interior of the nose may be rendered anæsthetic by cocaine, but in children or nervous patients, and when the case is not seen immediately, a general anæsthetic is advisable. Both nostrils should now be packed carefully with strips of sterilized gauze, enclosed in a rubber bag, or inserted between broad strips of green protective oil-silk, to facilitate its removal. The packing not only serves to keep the septum in position, but supports the bony framework of the nose : it must be changed every second day for a week, after which it may be omitted altogether. The patient should be confined to bed for a few days and the swelling of the soft parts reduced by the constant application of ice or an evaporating lotion ; an external splint is unnecessary. As a rule excellent results are obtained, the nasal bones being firmly set in about fourteen days. Occasionally the fracture of the septum results in an abscess (*see* SEPTUM NASI). When the cartilaginous portion of the nose is affected, the patient must be cautioned that even if there be no apparent deformity at the time, some may subsequently occur. Especially in children or youths, considerable progressive deformity may result, probably because the normal growth of the parts has been impaired.

When the fracture is not seen until some days have elapsed, the nose often seems firmly set in its new position. If less than two weeks have elapsed, a general anæsthetic should be given, and then an attempt made forcibly to replace the bones. If successful,

the after-treatment should be carried out as above described, but packing is often quite unnecessary, the bones retaining their proper position without support.

In old-standing cases, where the bones have become thoroughly set, little can be done. An operation on the deflected septum can be carried out so as to restore free nasal respiration, or if the deformity be merely a depression of the bridge of the nose it can be remedied by the insertion of cartilage (*see* p. 644). *H. Lambert Lack.*

NOSE, POLYPUS OF.—The so-called 'mucous' polypus of the nose is a circumscribed œdematous thickening or hypertrophy of the nasal mucous membrane, in consequence of rarefying osteitis of the underlying bone. When the disease is extensive, or when there is frequent recurrence, marked bone disease will be found, and will require treatment to obtain a successful result. Polypi grow only from the ethmoidal region of the nose: most commonly from the middle turbinate or the region around the hiatus semilunaris; more rarely from the roof of the nose or from the septum. Polypus is frequently associated with suppuration in some of the nasal accessory sinuses. Its successful treatment depends upon the recognition of its pathology. The method to be adopted varies according to the extent of the disease.

When *only a few polypi* are present they may be removed with a wire snare under cocaine anæsthesia. A 10 per cent solution of cocaine is applied on pledgets of wool, which are packed round the growths, and it is well to use adrenalin also, as the consequent contraction of the mucous membrane permits a better view of the parts and diminishes the bleeding. In about half an hour, when anæsthesia is complete, the wire loop of a polypus snare, such as Blake's, is passed around a growth and hitched up as close as possible to its attachment. The wire loop is then drawn tight until the pedicle of the polypus is grasped, when the pedicle may be cut through or the growth removed by avulsion. The latter method is the more thorough, but it is a little painful. This operation is repeated at one or more sittings until all the growths have been removed. After the operation the patient should irrigate the nose two or three times daily with a mild antiseptic, such as boric acid lotion. This treatment is most likely to be permanently successful when only one or two polypi of long standing are present. In such cases the active bone disease has often passed off and the bone has become sclerosed. If after removal of the growths it seems probable that active bone disease is present, the affected bone should be clipped away with Grünwald's forceps, aided if necessary by breaking open the ethmoidal cells with Hajek's hook, as described in the operations upon ethmoidal cell disease (*see* Nose, Accessory Sinuses of). Careful examination should be carried out to discover any sign of sinus suppuration, and any suspected cavity should be explored and treated. After removal the nose should be inspected at regular intervals, and any tendency to recurrence treated by the application of the galvano-cautery under cocaine. In this way a cure may be ultimately obtained in a large number of the milder cases.

When there is *extensive disease*, when the upper part of the nose appears filled with small polypoid growths, when the bone seems extensively affected and its normal outlines are lost, or when there is evidence of ethmoidal or frontal sinus suppuration, a more extensive operation should be performed in the first instance, provided the patient's general condition is favourable. The operation should be performed also in milder cases when polypi constantly recur in spite of the treatment described above. The chief contra-indications are age and ill health. I should never advocate the operation in patients over fifty, and should hesitate in patients over forty, unless the condition urgently demanded it. As age advances the ethmoid becomes more brittle and the operation consequently more dangerous. Moreover the bleeding is rapid and often severe, and might be alarming in a weakly person.

The operation consists in thoroughly scraping away all the polypi, diseased mucous membrane, and bone, with a ring curette under general anæsthesia. This is a dangerous procedure unless performed with great care and by an operator with considerable experience of nasal surgery. The results, when the operation is thoroughly carried out, are excellent. A complete cure can be promised in most cases, even of extensive disease, and however many minor operations have been previously carried out. For full details the reader must consult special text-books. The chief dangers are perforation of the cribriform plate with meningitis or cerebral abscess, abscess or cellulitis in the orbit, sepsis, and

hæmorrhage. The operation has, however, very little danger when properly carried out. When the patient is old or not in good health, the most that can be done is to remove the growths carefully, one or two at a time, with cocaine anæsthesia, until the nasal passages are clear. The operation must be repeated as the growths occur. In every case of nasal polypus careful search must be made for complications such as suppuration in one or more of the accessory sinuses, and these, if found, must be dealt with. *H. Lambert Lack.*

NOSE, REDNESS OF.—(*See also* ROSACEA.) This is usually an indication of dyspepsia. The diet should be restricted as in chronic GASTRITIS (q.v.) and the bowels regulated by aperients if necessary. The following stomach mixture may be prescribed :—

℞ Bismuthi Carbonatis Sodii Bicarbonatis	āā gr. x	Acidi Carbolici Infusum Gentianæ Co.	℥ij ad ℨss

Before each meal.

It has recently been found that the gastric acidity tends to be lowered in these cases, and the administration of dilute hydrochloric acid after meals is therefore always worth trying.

Ichthyol or subitol (3 min. or more) in capsule after meals is sometimes useful.

The patient should be forbidden to blow tobacco smoke through the nose or to take snuff. Locally, one of the following applications may be applied at night after steaming the nose over boiling water :—

℞ Sulphuris Præcipitati Calaminæ	āā gr. xxx	Acidi Carbolici Lanolini	℥vj ℨj
℞ Calaminæ Bismuthi Subnitratis Acidi Hydrocyanici Diluti	āā gr. x ℨij	Pulveris Tragacanthæ Co. Aquam	ℨj ad ℨj

In bad cases it may be necessary for the patient to wear a nose-shield for a time in order to protect the nose against wind and weather. *Robert Hutchison.*

NOSE, SYPHILIS OF.

Tertiary Syphilis.—Both general and local measures are required. The general treatment consists in the administration of antisyphilitic remedies in large doses. If a gumma is seen in the nose or extensive ulceration is present, the patient should be given large doses of iodide of potassium (20 to 25 gr. three times daily), with drachm doses of the liq. hydrarg. perchlor. If the case prove intractable, which usually means that the patient is in bad general health or is addicted to alcohol, it is best to keep him in bed, to feed him up by giving him three or four pints of milk daily in addition to plain ordinary diet, and then, after three or four days, to commence the iodide treatment again. In these circumstances it will usually succeed. Subsequently, after healing has taken place, a thorough course of antisyphilitic treatment should be carried out.

The local treatment consists in cleansing the nose three or four times daily with a mild antiseptic lotion, such as a solution of boric acid. If very exuberant granulations be present, they may be cauterized, or a little calomel and starch applied. If a loose sequestrum be found, it must be removed with forceps or with a blunt hook (*see* NOSE, FOREIGN BODIES IN). It may be necessary to divide a large sequestrum with bone forceps to facilitate its removal. When healing has taken place, if there is much deformity, a plastic operation may be performed (*see* p. 644).

Inherited Syphilis.—The general treatment consists in the administration of mercury, either by the mouth or by inunction. Half-grain doses of hydrarg. cum creta may be given to an infant three times a day, or a few grains of mercurial ointment may be rubbed into the abdominal walls. If the affection does not rapidly yield to this treatment, one or two grains of iodide of potassium may be administered three times a day in milk. Every effort should be made to maintain the infant's general nutrition. If the nasal obstruction prevent the administration of food in the usual way, spoon feeding must be adopted.

In addition to these measures, local treatment must be carefully carried out. The nose should be syringed regularly once or twice a day. The infant should be held face downwards over a basin, and the fluid injected very gently into the nose by means of a

small glass syringe with a short length of rubber tubing attached. The best lotion is a warm solution of salt and water (1 drachm to the pint), to which ½ oz. sanitas or 5 gr. potassium permanganate may be added. This treatment, if regularly carried out, greatly hastens the cure and diminishes the risks of subsequent ill-results. Clearing the nose aids the administration of food and thus lessens the danger of malnutrition. The chief ill-results that may follow severe or neglected cases are ozæna or atrophic rhinitis, the direct result of long-continued suppuration, and a falling-in of the bridge of the nose, apparently due to arrested development of the nasal bones. This deformity, the so-called 'saddle-backed' nose, has recently been treated with marked success by subcutaneous insertions of cartilage (*see* p. 644). *H. Lambert Lack.*

NOSE, TUBERCULOSIS OF (Lupus).—The most common forms of tuberculosis are an extremely slow but progressive superficial ulceration of the mucous membrane, and a hypertrophic form characterized by the formation of exuberant, pale, fleshy granulations. Very rarely a tuberculous tumour is met with, or a typical tuberculous ulcer with thin undermined edges.

The disease usually commences on the anterior part of the nasal septum, or the anterior end of the inferior turbinate. Thence it may spread back along the septum, or forward into the vestibule and on to the face. The palate and larynx may become affected without direct continuity. The disease may cause a perforation of the cartilaginous septum, but rarely or never attacks the bone.

In treating this affection, general and local measures should be combined. The patient should be placed under the most favourable hygienic conditions, he should live as much as possible in the fresh air, and should take a plentiful and nutritious diet. Any disturbance of the general health must be rectified. The internal administration of arsenic frequently acts beneficially on lupus of the upper air-passages, and is well worth a trial. Three to five minims of liquor arsenicalis should be given three times a day immediately after food, and the dose slowly increased, provided no gastric symptoms or other evidences of poisoning are produced, until ten to fifteen minims are taken three times a day. Lupus has a greater tendency to recur in cold weather than in warm, and the patient must always be carefully watched during the late winter months. If there is recurrence at this time of the year, the best plan would be to send the patient to a warm climate for the winter. If he keeps well for one or two winters, there would probably be no further trouble even in the cold weather. In intractable cases small doses of tuberculin may be tried (*see* Specific Therapy), but lupus of the nose generally yields to local measures, and the results with tuberculin have not been sufficiently successful to recommend its general use. It may, however, be cautiously employed in conjunction with local treatment if the latter alone seem to fail.

The *Local Treatment* is most important. In the majority of cases the best results will be obtained by the application of caustics. The nose should be thoroughly anæsthetized by the application of cocaine and suprarenal extract. Pledgets of wool soaked in the solution and gently squeezed out should be applied to the parts for half to three-quarters of an hour, so that the tissues may be rendered as bloodless as possible. Any strong caustic would probably act well, but nitrate of silver, chromic acid, and chloride of zinc are the most convenient. A few crystals of nitrate of silver should be melted and fused on the tip of a silver probe. The surface of the ulcer or the granulations are freely cauterized, and the caustic-bearing point of the probe is also thrust deeply into the softened diseased tissues. The application causes very little bleeding, and a large area may be done at one sitting. After about ten to fourteen days, a second application may be made; three or four thorough applications of this kind will usually suffice to remove an extensive area of disease, even when covered with exuberant granulations. Chromic acid is applied in the same way, by fusing it on a probe; chloride of zinc should be made into a thick paste by pounding it up with a few drops of water and glycerin, and must be applied on a pointed wooden stick. After all the obvious disease has been removed, the patient should be seen at intervals of three or four weeks, so that any recurrence may be dealt with at once. After a time it would be sufficient to see him once in two months, and then, if there is no recurrence for a year, treatment may be left off.

In cases of extensive disease, the general practice is to curette the nose thoroughly

under local or general anæsthesia. This method may shorten the treatment a little where there are very exuberant granulations or extensive disease, but in my hands the results have proved disappointing, and I now rarely recommend it. In spite of the application of suprarenal solution, the bleeding is always brisk and quickly renders it impossible to see accurately what is being done. Normal tissues may be scraped and disease left behind ; the raw surfaces are apt to become infected by the disease, and the lupus may soon recur as badly as before. Moreover, cicatricial contractions and deformities are far more likely to occur than after the method above described. Diathermy has been tried, but is also open to the same objection, extensive cicatricial contractions usually resulting. In some cases the application of nitrate of silver causes great pain for twelve to twenty-four hours. This must be relieved with aspirin, bromide, or even morphia if necessary. The actual cautery may be substituted ; it is much less painful, but also less effective, although quite sufficient for slight cases.

If a tuberculous tumour be present, it should be removed with the snare or by curettage. Cocaine anæsthesia may be sufficient, and is to be preferred to general anæsthesia if the patient will allow it. This form of the disease is usually associated with pulmonary tuberculosis ; the patient does not stand operation well, and may run considerable risk if blood enters the lung. A few days after the tumour has been removed, the base of the growth should be anæsthetized with cocaine and thoroughly cauterized. If an extensive superficial ulcer with undermined edges be present, cocaine should be applied, and the base and the edges of the ulcer thoroughly cauterized. In both these conditions phthisis is usually present, and therefore general treatment also must be carried out. (*See also* LUPUS VULGARIS.) *H. Lambert Lack.*

NOSE, TUMOURS OF.

Benign Tumours.—With the exception of nasal polypus (q.v.), benign tumours of the nose are all rare, and may be very briefly dealt with.

Papillomata, when growing from the *vestibule*, should be snipped off with scissors, and the base dried and thoroughly cauterized. If the growth be sessile, and especially if it occur in a middle-aged or elderly patient, it is better to give a general anæsthetic and to excise it freely, together with a margin of healthy tissue. Pedunculated growths springing from the *mucous membrane* may be removed with a snare under cocaine, and their bases cauterized ; small sessile growths may be destroyed with the electric cautery.

Fibromata must be removed. If the growth be small and pedunculated, it may be removed with the snare under cocaine or under general anæsthesia. A strong snare threaded with thick wire must be used, as the growth is generally tough. The growth should be slowly cut through, so as to lessen the danger of hæmorrhage, and its base freely cauterized. If a large growth with extensive attachment be present, it will be necessary to open up the nasal cavity by an operation such as is required for malignant disease of the nose (q.v.), in order that the origin and attachments of the growth may be freely exposed to view. The growth can then be radically removed, with as much of its attachments as seems necessary, and any bleeding (which may be free) can be dealt with in the usual way.

Enchondroma and *Osteoma* are very rare ; they usually spring from the ethmoidal region and project into the orbit or one of the nasal accessory sinuses. They always require removal, and it is generally necessary to perform an extensive operation, the exact nature of which depends upon their size and position. If the ethmoidal region be involved and the growth project into the orbit, a free incision curving round the inner side of the orbit should be made and the neoplasm freely exposed and removed. A growth involving the frontal sinus requires an operation on that sinus similar to the radical operation for frontal sinus operation (*see* NOSE, ACCESSORY SINUSES OF).

Fibro-angeioma of the septum is a rare tumour growing from the anterior part of the septum just behind the vestibule. It must be thoroughly removed, as it has a considerable tendency to recur. The best plan is to anæsthetize the parts with cocaine and suprarenal extract, and then, under good illumination, an incision is made with the cautery point through the healthy mucous membrane all round the growth at a slight distance from its attachment. The mucous membrane and the perichondrium of the septum are then together with the growth, detached from the underlying cartilage. The after-treatment

consists in applying oil or ointment to the wound, until complete healing has taken place.

Malignant Tumours may be either sarcomata or carcinomata.

A growth springing from the floor of the nose, the septum, or inferior turbinate is the most favourably situated for operation. It may be freely exposed by an incision through the gingivo-labial junction from opposite the first molar tooth on one side to the same point on the other side of the jaw, and then the upper lip, soft parts of the face, and nose raised by detaching them from the bone. The antrum may be opened through the canine fossa, and the inferior turbinates, the outer wall, the floor, and the septum of the nose may be cut away as freely as necessary. After removing the growth the parts are allowed to fall naturally into position again, and as a rule there is very little deformity. A squamous epithelioma in this region is often of very slow growth and not very malignant. It rarely gives rise to secondary growths in the glands or elsewhere, and hence is particularly favourable for operation. Even partial operations, such as scraping, are occasionally successful in relieving the patient and in considerably prolonging life.

Growths involving the ethmoidal region are less favourably situated and usually very malignant. If not too extensive, they may be removed by a combined internal and external operation. A long curved incision is made round the inner side of the orbit, and the periosteum along the inner wall of the orbit separated as far back as possible. The entire lateral mass of the ethmoid is now removed piecemeal, partly through the nose and partly through the external incision. Repeated applications of radium may give good results and occasionally effect a cure. In the large majority of cases radium treatment should be given the preference to operation.

Malignant growths involving the posterior part of the nasal cavity, or springing from the sphenoidal region or the upper part of the postnasal space, are usually inoperable. Most of these cases are sarcomata, and radium treatment is frequently successful. It is quite easy to embed a tube of radium in these growths for as long as may be desired. A large quantity of radium, well screened, is placed in position for twenty-four hours, and the application repeated in five or six weeks. *X*-ray treatment has also cured a considerable number of these cases, even when the glands in the neck have also been involved.

Another growth met with in this region is the so-called 'recurrent fibroma'. These growths are not very malignant; there are no secondary deposits or glandular involvement, although they have a great tendency to recur locally. If growing from the top of the postnasal space, they may be exposed through the mouth. A laryngotomy is performed, the mouth opened widely, and the lower pharynx firmly plugged with large sponges to prevent blood entering the larynx. Then the soft palate and the tissues covering the hard palate are divided in the middle line, the soft parts, including the periosteum, turned off the bone, and as much of the bony palate chiselled away as is necessary to get a good view of the tumour. An incision is made all round the growth, which is then cut or gouged away from the bone, and afterwards the wound in the palate is carefully sutured.

Two modifications of these methods have recently been practised, and will probably be adopted generally in the near future. Instead of chloroform, ether may be given by the intratracheal method. This obviates the necessity of a laryngotomy and of plugging the pharynx with sponges, as there is no tendency for blood to enter the larynx. Also, after splitting the palate, the growth may be removed by diathermy. This method is entirely bloodless, and the base of the growth is well cauterized.

If the growth extend into the upper part of the nose, the above operation may not give a very good exposure, and Watson Williams's method may be recommended. The nose is opened by an incision along the line of the eyebrow, extending inwards to the middle line and then down the centre of the nose to the end of the nasal bones; with chisel and saw the bones as well as the soft parts are divided; next a small incision is made round the inner angle of the eye, and the lachrymal duct pushed outwards and the nose entered; through this opening a Gigli saw is passed, and the bone below it divided, and also the bone above which forms the floor of the frontal sinus; the flap is then turned outwards, and by removing the middle turbinate a splendid view of the back of the nose can be obtained. The growth can now be dealt with in the way considered most suitable.

Occasionally more extensive operations are required. Thus, if the growth involves the antrum, partial or complete removal of the upper jaw is necessary.

When a growth is inoperable and radium fails, all that can be done is to relieve the most distressing symptoms. Pain can be kept in check by aspirin or opiates. The nose can be cleansed by syringing with boracic lotion, sanitas, or permanganate of potash; and bleeding, if excessive, must be checked by packing the nose with strips of gauze. If the growth projects into the mouth or pharynx, and causes much obstruction to breathing or swallowing, the best plan is to break away pieces of it with the finger. The growths are usually friable and break down easily, and this treatment is preferable to performing a tracheotomy or to subjecting the patient to tube feeding. *H. Lambert Lack.*

NYSTAGMUS AND HEAD-NODDING (Spasmus Nutans).—These affections, with rotatory, horizontal, vertical, or oblique movements of head and eyes, appear to be due to want of correlation between the action of ocular and cervico-cranial muscles. They have been attributed to residence in dark rooms in which there are one or more spots of bright light, the fixation of which exhausts the retina; also to intestinal toxæmia, rickets, and of course to dentition. The evidence of such causation is in each case insufficient. In a few instances, nystagmus and head-nodding are associated with feeble-mindedness, and may be persistent; but in the majority the movements cease spontaneously, without special treatment, towards the close of the first dentition.

Bromides and phenazone, which have been recommended, are quite unnecessary, and indeed are contra-indicated if the condition is, as maintained, an instance of imperfectly established co-ordination.

All that is necessary in most cases is attention to general hygiene, and provision of diet suitable to the ordinary child. The subjects of these affections are usually nervous and hypersensitive to noise. *Leonard G. Guthrie.*

OBESITY.—In the majority of cases which present themselves for treatment, those, namely, in which the condition has supervened in the later part of middle life, the accumulation of fat is due to a disproportion between the intake of energy in the form of food and its output in the form of muscular work. The proper way of dealing with such cases, therefore, is to cut down the diet, and to recommend the taking of more exercise. It is true that cases of obesity are sometimes met with in young subjects in whom there seems to be a tendency to the formation of fat even in the absence of any undue consumption of food. Such cases are difficult to explain, and may depend upon some congenital vice of metabolism or derangement of internal secretion; at all events they do not readily lend themselves to treatment.

1. **Dietetic Treatment.**—Of the nutritive constituents of food, the carbohydrates and fats, especially the former, contribute most to the formation of adipose tissue, and it is the consumption of these which it is most necessary to restrict. Various schemes of diet have been devised, which differ chiefly in the degree to which each of these constituents is reduced. The following are examples :—

	Protein. Grms.	Carbo-hydrate. Grms.	Fat. Grms.	Calories
Normal Standard ..	125	500	50	3027
Banting	172	81	8	1110
Oertel (max.)	170	120	45	1600
,, (min.)	156	75	25	1180
Ebstein	102	47	85	1300
Hirschfeld (max.) ..	139	67	65	1400
,, (min.) ..	100	50	41	1000
Von Noorden	155	112	28	1366

It will be observed that in most cases the proportion of protein, as being least likely to form fat, is increased, whereas the carbohydrates and fats are reduced below the normal, although in varying ratio.

The arrangement of some of these schemes into meals is as follows :—

BANTING.

Breakfast.—4 or 5 oz. of meat or fish ; 1 oz. of toast ; tea without sugar or milk.

Dinner.—5 to 6 oz. of lean meat or fish ; any vegetable except potatoes ; 1 oz. of dry toast ; some stewed fruits ; 2 or 3 glasses of claret.

Tea.—2 or 3 oz. of fruit ; a rusk or two, and a cup of tea.

Supper.—3 or 4 oz. of meat or fish.

EBSTEIN.

Breakfast.—2 oz. of bread with plenty of butter ; a large cup of tea without sugar.

Dinner.—Soup ; 4 to 5 oz. of meat ; green vegetables ; fresh fruit, and 2 or 3 glasses of light wine.

Afternoon.—Same as breakfast.

Supper.—1 egg ; meat, ham, or smoked fish ; 1 oz. of bread with plenty of butter ; a little cheese ; fresh fruits.

VON NOORDEN.

8 *a.m.*—3 oz. of cold lean meat ; 1 oz. of bread ; a cup of tea or coffee, with a spoonful of milk but no sugar.

10 *a.m.*—1 egg.

Noon.—A cup of strong soup without fat.

1 *p.m.*—A small plateful of clear soup ; 5 oz. of lean meat or fish ; 3½ oz. of potatoes ; green vegetables ; 3½ oz. fresh fruits.

3 *p.m.*—A cupful of black coffee.

4 *p.m.*—7 oz. fresh fruit.

6 *p.m.*—A glass of skimmed milk.

8 *p.m.*—4½ oz. of cold lean meat ; 1 oz. of whole-meal bread ; 2 or 3 spoonfuls of fruit, cooked without sugar.

In adopting one or other of these plans, the patient's tastes must be consulted, but Banting's system has the great advantage of being simple, and easy to carry out. One should make sure, however, that the kidneys are in a healthy state before recommending it, owing to the large excretion of waste nitrogenous matters which its adoption entails. It must be remembered, too, that they are all more or less 'starvation diets', and should therefore not be persisted in for more than a few weeks at a time, during which the patient must be kept under strict observation, and the weight not allowed to run down too rapidly ; three pounds a week is a sufficient rate of loss.

In slighter cases, or in more pronounced examples of obesity after the weight has been reduced by one or two stones, a 'subsistence diet' should be adopted for permanent use. This will resemble an ordinary diet, except that sugar, potatoes, sweets, and all rich or fatty articles or dishes are absolutely forbidden, and the consumption of bread is restricted to about 4 oz. a day.

In every case the patient must be instructed to live by rule and measure, and to weigh out the food he eats until such time as he can be trusted to estimate it approximately from experience. Too great variety should be avoided as tending to increase appetite, and for the same reason the use of pickles, condiments, and all articles that increase the desire for food, should be forbidden.

The Use of Particular Articles of Food.—Sugar, it need hardly be said, should be forbidden altogether, and saccharin employed as a sweetener instead. Milk also is a very fattening food. Visible fat should be removed from meat, and the richer meats, such as pork, goose, duck, etc., and the fatter fishes (e.g., salmon, herring, and mackerel) avoided. Puddings must be unconditionally forbidden. Bread is allowable only in weighed quantities, and toast, in spite of the popular impression to the contrary, is even more dangerous. There is an advantage in selecting the coarser sorts of bread, such as whole-meal, as being more 'satisfying' in proportion to their bulk. Potatoes are not so harmful as bread, but, on the other hand, are less missed. Green vegetables may be allowed freely, and have the advantage, owing to their bulk, of producing a feeling of

satisfaction. Dried fruits are too saccharine for the corpulent. Fresh fruits may be allowed in moderation, but if cooked should be sweetened with saccharin.

All beverages which contain sugar (e.g., the sweetened aerated drinks) should be forbidden. Alcohol, being a great sparer of fat, is best avoided altogether by the corpulent. If indicated on other grounds, it should be given in the form of plain spirit. Malt liquors are never permissible.

The belief that the restriction of fluids has a direct influence in reducing obesity is probably erroneous. Such a restriction acts only by making it more difficult for the patient to consume his customary quantity of solid food. Limitation of fluids should be insisted upon, however, when any of the following conditions are present: (1) Weakness of circulation; (2) Excessive sweat secretion; (3) Where it lessens the patient's desire for fatty foods. Where a Banting or any other very highly nitrogenous diet is being practised, the restriction of fluids is dangerous as being opposed to the free elimination of waste products.

The treatment of obesity, in its milder forms at any rate, is often more easily and more conveniently carried out at a health resort than at the patient's own home. Carlsbad, Homburg, and Marienbad are the best resorts for the purpose, although none of them is available in the winter or spring months.

2. **Exercise.**—If the patient is able to take active exercise, the treatment of obesity is greatly simplified. If the degree of corpulence renders this impossible, massage may be used at first as a substitute. Any form of active exercise is good, but gentle hill-climbing is particularly advantageous if the state of the patient's heart permits of it. It may be well to point out that riding is of little use in reducing obesity, for, as it has been well remarked, "It is the horse that gets thin, and not the man." The production of muscular contractions by the Bergonié system, which is an artificial substitute for hard exercise, is described in the article on electrotherapeutics.

Turkish baths are helpful in many cases, but they are directly contra-indicated if there be any weakness of the circulation.

3. **Drugs.**—Thyroid is the only medicinal substance known which has the power of increasing the destruction of tissue in the body. Unfortunately, however, it acts upon the nitrogenous as well as upon the adipose tissue, and for this reason it must be used, if at all, with great caution, and, where employed, care must be taken that the amount of protein in the diet is in no way restricted. Five grains of the dried gland twice a day would be a sufficient dose. Of the drugs which have been recommended, such as *Fucus vesiculosus*, none is at all trustworthy; of the many patent and proprietary remedies for obesity which are sold, some contain *Fucus vesiculosus* (e.g., Trilene), some citric acid (e.g., Antipon) or sulphur, some in all probability (although this has not been proved) thyroid.

Robert Hutchison.

ODONTOMATA.—(*See* Jaws, Tumours of.)

ŒSOPHAGUS, FOREIGN BODIES IN.—(*See* Foreign Bodies in Air-passages and Œsophagus.)

ŒSOPHAGUS, SURGICAL DISEASES OF.—The general statement may be made that the successful treatment of diseases of the œsophagus demands a high degree of technical knowledge, and that it is best conducted by surgeons of wide experience in the subject and expert in direct endoscopic methods. The blind passage of bougies is not only fraught with considerable danger (e.g., in cases of sharp foreign body, ulceration, or malignant disease), but can seldom be relied upon to furnish a genuine diagnosis. The diameter, length, and situation of a stricture can often be determined with the bougie, but the nature of the disease remains unknown, and treatment therefore cannot be adopted with precision; moreover, the bougie can readily slip past a foreign body, an ulcer, or new growth of small size, with misleading results.

The surgeon who has not studied modern developments in this branch, and whose work lies in remote parts of the world, will undoubtedly have to deal with cases of foreign body in the gullet, the treatment of which is dealt with in another article (*see* Foreign Bodies in the Œsophagus); but with regard to cases of disease I would

advise him to leave treatment alone as far as possible, or else to make a genuine study of the subject.

Certain conditions, however, will demand immediate attention.

Acute Œsophagitis.—1. *From Corrosive Chemicals.*—Direct the patient to sip the appropriate antidote, or gently introduce a stomach-tube and wash out the œsophagus. This must be done at once, for when the period of exfoliation or erosion has been reached, no further introduction of instruments should take place. Emetics must not be given. Absolute rest in bed is essential; and pain may be allayed by sucking ice, sipping iced soup, etc., and the exhibition of opiates. Rectal feeding may be necessary.

Inflammatory swelling of the larynx may be prevented by sucking ice, applying the ice-bag externally, and spraying with adrenalin. Scarification of the epiglottis and arytenoids, or tracheotomy, may be necessary. No bougie should be passed until four weeks have elapsed. It is not desirable to use the œsophagoscope in the early stages of these cases.

2. *From Laceration by a Foreign Body.*—Successful treatment mainly depends upon correct diagnosis, but severe cases with much pain and fever have recovered, in the absence of strict diagnosis, where sedative and antiseptic measures have been adopted.

The possibility of extension to the larynx must be remembered, and preparations made for scarification of the arytenoids and epiglottis, and for tracheotomy. Ice may be sucked, the ice-bag applied, and adrenalin sprayed into the throat. Nourishment may be given through a rubber catheter cautiously introduced.

3. *From Scalding Drink and Food.*—Iced drinks, rectal feeding, and sedatives should be used. The small larynx of a child may become obstructed by inflammatory swelling with great rapidity. Apply the ice-bag to the neck, spray with adrenalin, and give ice to suck.

4. *From Acute Infectious Diseases.*—Inflammatory phenomena may occur in diphtheria, thrush, scarlet fever, small-pox, erysipelas, and typhoid, and require the treatment indicated in preceding paragraphs.

5. *From Alcoholism.*—In alcoholics, both acute and chronic œsophagitis occasionally occur. Rest and sedative treatment is indicated both for the local and gastric condition. Inflammation may also occur after prolonged bilious vomiting.

Chronic Œsophageal Catarrh.—This occurs in alcoholics, after acute infectious diseases, and in conjunction with strictures both benign and malignant, and especially where dilatation exists and decomposition of retained food occurs.

The treatment is lavage with warm, dilute, alkaline, antiseptic lotions. The sipping of 3-vol. peroxide is valuable in many cases of malignant stricture.

Ulceration and Fissures.—The latter may occur in conjunction with chronic gastric disturbances. The treatment of choice is the local application of silver nitrate under accurate visual control through the œsophagoscope. The condition is rare, and many laryngologists have no practical experience of it.

Hæmorrhage.—Perforation of the great vessels by a foreign body, ulceration, and malignant disease must be borne in mind. Hæmorrhage may, however, occur from veins about the lower segment of the gullet in cases of cirrhosis of the liver, also from varices and from ulcerated areas. Ice may be sucked, adrenalin or ergotin administered, and the part kept at rest by rectal feeding.

Severe hæmorrhage has been controlled by plugging through the œsophagoscope.

Syphilis.—Where œsophageal symptoms exist in a case of active syphilis, I would emphatically urge the reader to rely solely upon the medical treatment, unless he be expert with the œsophagoscope. I have seen ulcerative perforation of the aorta in a case of syphilis where nothing more than slight discomfort in swallowing was complained of. With regard to the treatment of cicatricial stenosis, *vide* opening paragraph, and also page 656.

Tuberculosis.—Ulceration is occasionally found post mortem in tuberculous patients. Clinical experience is rare. One may assume from experience with pharyngeal cases that the ingestion of orthoform or of anæsthesine in the form of powder will allay dysphagia.

Œsophageal Obstruction.—It goes without saying that a certain number of cases of difficulty of swallowing, with or without pain, present no gross physical lesion and are genuine neuromuscular phenomena. The matter of prime importance is the diagnosis,

i.e., the definite exclusion of organic disease, and this can scarcely be done without considerable experience with the endoscopic methods. Every laryngologist has doubtless met with the case of obstruction at the cricoid region, occurring perhaps in a young or middle-aged woman of hysterical type, which has turned out on careful examination to be one of postcricoid carcinoma; while most of his cases of supposed idiopathic cardiospasm have proved, on œsophagoscopy, to be dependent upon the presence of malignant disease, ulceration, or fissure. In a short article confined to treatment, as apart from diagnosis, it is therefore impossible to give much information of genuine value; and probably everyone concerned will be saved much distress, expense, and danger, if an opinion is obtained at the outset from an expert in this matter—and one at least may be found in any large centre to-day—and his advice carried out.

1. *Spastic Stricture.*—In the case of anæmic women with defective teeth, in obvious cases of hysteria with partial anæsthesia of the pharynx, and in the case of highly-strung nervous persons suffering from the effects of mental strain, no harm can result from a short course of bromide and valerian, the supply of an adequate denture, and instructions concerning proper mastication. In this class of case complete relief may speedily result from such treatment, to be followed by speedy recurrence. Under such circumstances the gentle and repeated introduction of a large-sized bougie or rubber œsophageal tube may be of great service, and in conjunction with the other measures may lead to permanent cure. On no account should a small bougie be used, nor should any but the slightest pressure be employed. Even in so simple a matter as this there are profound pitfalls, and to emphasize what I have already said to this effect I will quote a pre-eminent authority, Charters Symonds, who considers that a bougie will pass a malignant stricture of the lower end more readily than it will pass a spastic one.

In this connection one must point out that genuine spastic conditions, which yield temporarily to sedative treatment and the bougie, are in fact often set up by, or at all events associated with, malignant disease which escapes detection with the bougie; it may indeed be said that in the majority of cases of difficult deglutition the diagnosis of malignancy is ultimately arrived at.

2. *Cicatricial Stricture.*—Such a stricture, whether of traumatic or syphilitic origin, is still treated by the progressive use of bougies. The position and character of the upper orifice is determined by direct endoscopy, and the vertical length of the stenosis by means of Charters Symonds's olive-headed bougies.

Valuable information as to the size, course, and length of the stenosed passage is obtained with the *x* rays and bismuth paste. A stricture of short vertical extent can sometimes be dilated, without any special experience, by the passage of bougies; but the surgeon must be prepared for recurrence, and it is well to see the patient every three months during the first two years.

In larger works, various ingenious devices will be found detailed; but I would urge the reader to avoid the use of filiform bougies and mechanical dilators until he has mastered the direct method and made a study of the special literature.

3. *Malignant Disease.*—In the hypopharyngeal or postcricoid region, a type of epithelioma occurs which is of comparatively low malignancy. It is superficial in origin, and the submucous tissues and the lymphatic glands may remain for many months unaffected. It often occurs in young and middle-aged women, who may complain of nothing more than persistent pricking or of roughness on swallowing pungent or dry food. Sometimes pain is elicited by pressing the cricoid back against the spine. The laryngoscope may reveal nothing abnormal. Thanks to the fact that the area involved does not come within the influence of the aspiration of the thorax, these cases may be attacked by operation with a prospect of success. In suspicious cases, therefore, it is very desirable to secure a diagnosis by the direct method.

When malignant disease is confined to the ostium it may be removed with some possibility of success, but operation upon genuine thoracic cases is in the experimental stage at the present date.

A certain number of cases have been genuinely relieved by treatment with radium, and possibly a few have been permanently cured. The details as to dosage, screening, and the disposition of the tubes are highly technical, and the paper by William Hill (*Trans. Med. Soc.*, London, 1911) may with advantage be consulted. In some cases a

functional lumen may be maintained by the daily passage of bougies, and even by repeated curettage through the œsophagoscope, needless to say at the cost of very considerable risks.

These strictures not infrequently occur at or about the level of the tracheal bifurcation (i.e., about ten inches from the teeth, or nearly twelve if the flexible bougie is employed), and in this situation Charters Symonds's short funnels may be retained with almost complete comfort for many months. The form with the terminal orifice should be used, and the special introducer employed. These short tubes are unfortunately seldom of use at the upper or at the lower end of the gullet. For strictures at these points a long tube (i.e., a simple red rubber tube; or Hill's, which is stiffened with wire) should be inserted and, once inserted, retained as long as possible. The upper end may be attached to the upper teeth or brought out through the nostril. Gottstein considers it both better and safer to introduce drainage tubes by von Hacker's method, leaving them *in situ* for a few hours, and repeating the process several days in succession. A sheath of stretched tubing is applied to a mandrin by hitching the rubber over the pointed ends of the latter. The superfluous portions of rubber are cut off. After insertion of this comparatively narrow instrument through the stricture, the rubber tube is allowed to resume its full diameter by removing the mandrin. *Fig.* 54 (from *Keen's Surgery*, page 783) indicates the method of stretching the tubing over the mandrin.

On theoretical grounds it would seem well to perform gastrostomy early, and so keep the œsophagus in a state of comparative rest; results in practice, however, are not very encouraging.

A good deal of the distress accompanying malignant stricture is due to septic inflammatory phenomena, and the patient, therefore, should flush his gullet with water after taking food, and also sip 3-vol. peroxide several times daily. When the *x* rays reveal the presence of a dilatation above the stricture, this should be washed out by the patient with a syringe and two-way catheter.

Some surgeons employ irrigation with dilute silver nitrate solutions; atropine may be used to reduce secretion, and opiates need not be withheld.

No fibrous food of any kind should be taken; semisolids rubbed through a sieve, and jelly, will often prove easier to swallow than fluids.

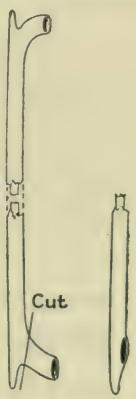


Fig. 54.
Von Hacker's tube for dilating strictures.

4. *Pouches.*—The so-called traction-pouches, usually the result of cicatrization about the bronchial glands in the neighbourhood of the bifurcation, are of no therapeutical importance, for they seldom produce evident symptoms.

The better-known pulsion-pouches may cause difficulty in swallowing, by compressing the œsophagus from without when distended with food. They are herniæ of the posterior wall of the hypopharynx, and arise above the band of muscle fibres which constitutes the ostium of the œsophagus proper, and as a consequence they can be removed with far less risk than that entailed by a genuine intrathoracic operation—although, in fact, the fundus of a large pouch may enter the thorax.

As a rule, a pulsion-pouch is a strictly cervical lesion, and when distended may be felt as a projection, generally upon the left side of the neck. The diagnosis from a high dilatation of the œsophagus must be determined by the *x* rays and direct endoscopy.

The access is fairly good through an incision along the anterior border of the sternomastoid, and the point of origin, sometimes forming a fairly narrow pedicle, will be found about the level of the inferior edge of the cricoid cartilage. In a few cases where the pouch was small, a good and permanent result has been obtained by inverting the hernia into the œsophagus, and preventing its re-expulsion by suturing. As a rule the pouch should be removed, its pedicle closed with a purse-string suture, then inverted into the gullet, two or three layers of stitches being subsequently inserted to prevent eversion.

Butlin, on several occasions, failed to create a watertight closure capable of resisting the strain entailed by the act of deglutition. It is therefore highly desirable to keep the neck wound open and packed until the danger of mediastinitis has passed.

In order to avoid the danger of mediastinitis the operation may be conducted in two

stages. At the first operation the pouch is gently eased up from its position in the thorax and, without being opened, is drawn out of the neck wound and stitched to the skin. After a delay of some days to allow of the mediastinum being sealed off, the pouch is removed at a second operation.

In the case of small pouches the fundus is stitched to the deep fascia at the first stage. In several cases recently it has been found that the first stage has sufficed to relieve the patient of all symptoms, the second stage appearing to be unnecessary. The fundus should be drawn well upwards before suturing if this conservative method is contemplated, and an *x*-ray examination must be made from time to time in order to detect any tendency of the pouch to sag into its former intrathoracic position.

Where operation is, on general grounds, contra-indicated, the patient may live for many years well nourished and in complete comfort if the sack is washed out with a syringe and catheter. The latter always enters the pouch with the greatest ease, and never penetrates the ostium. In some cases this lavage must be performed during the middle of the meal, in order to enable the later courses to be swallowed ; in others it is necessary only at the end of the meal, in order to remove food which otherwise would be retained and undergo decomposition. It is essential to wash out the pouch at bedtime; otherwise rest will be disturbed by the cough which is caused by the repeated rejection of foam and food. The escape of food into the pharynx during sleep may cause septic pneumonia.

In conclusion, I would warn the reader from obtaining an incorrect perspective concerning œsophageal obstruction. Text-book articles upon the subject very naturally dwell largely upon the curable conditions, and the reader may inadvertently be led by the authors to suppose that cicatricial and spastic obstructions are fairly common. Prolonged hospital experience leads me to a very different conclusion, which I find is shared by those who have devoted themselves to the subject. A few universally-recognized authorities and writers are entrusted with the treatment of a considerable number of benign cases, but unhappily the great majority seen in general practice will ultimately prove to be malignant. *E. B. Waggett.*

ONYCHIA.—(*See* NAILS, DISEASES OF; WHITLOW.)

OPHTHALMIA NEONATORUM.—(*See* CONJUNCTIVA, DISEASES OF.)

OPHTHALMIA, SYMPATHETIC.—(*See also* GONORRHŒA.)

PREVENTIVE TREATMENT.—It must be borne in mind that all eyes with a penetrating injury are liable to excite sympathetic disease in the fellow eye. Such injuries are especially dangerous : (1) If the injury produces entanglements of any part of the uveal tract (iris, ciliary body, choroid) or lens capsule, which is covered only by a thin layer of epithelium ; (2) If the injured eye contains a foreign body ; (3) If the injury results in a chronic iridocyclitis. (Eyes in which *suppuration* has taken place as the result of the injury practically never give rise to sympathetic ophthalmia, and need cause no anxiety.)

All eyes which have been so severely injured that the sight is irretrievably lost should be excised at the earliest opportunity.

When there has been a perforating wound with entanglements, and the eye has not quieted down in two, or at the very latest three, weeks, and if there is haziness of the cornea, muddy iris, and keratitis punctata, the question of removal must be seriously considered.

When sympathetic ophthalmia has already shown itself, as evidenced by circumcorneal flush, keratitis punctata, posterior synechiæ, and vitreous opacities, the question as to whether the exciting eye should be removed is often extremely difficult to decide. (1) If the exciting eye is blind, or practically so, and is painful, or contains a foreign body, it must be removed forthwith. (2) If the exciting eye has moderate sight, or an operation at a later period is likely to give useful vision, and if the sympathetic disease in the fellow eye is extremely acute, with intense iridocyclitis, it is wise to leave the exciting eye, which may finally retain the better vision of the two.

The treatment of the disease, once developed, must be both general and local.

GENERAL TREATMENT consists in a course of purging, diaphoresis, and the administration of mercury. A brisk purge must be given at the commencement of the attack, and

care taken to secure a free daily action of the bowels. Diaphoresis is best promoted by the hot-air bath or the hot pack, fortified, if necessary, by subcutaneous injections of pilocarpine nitrate, $\frac{1}{12}$ to $\frac{1}{3}$ gr. Mercury must be pushed to salivation, and, failing this, acetylsalicylic acid and acetozone may be tried. Of late, salvarsan has been given with great success in a number of cases of sympathetic ophthalmia; an injection should be given directly the condition is verified, and this should be repeated.

Local Treatment consists in the protection of the eyes by dark glasses, the use of atropine, hot applications, and leeching.

Every effort must be made to dilate the pupil with atropine, and if the weaker ointment (4 gr. to the ounce) fails to attain this object, the strength must be increased to 8 gr. to the ounce, careful attention being paid to the possibility of toxic symptoms developing. If the atropine gives rise to marked local irritation, a substitute must be tried. (*See* Iritis.)

The application of two leechs to the temple, repeated every other day if necessary, will assist the atropine in dilating the pupil, and at the same time greatly relieve the pain and congestion of the eye. Heat in the moist or dry form must be persevered with regularly, either by means of frequent hot boracic bathing, by the application of the Japanese muff-warmer, or the Maddox electric pad. (*See* Iritis.)

In spite, however, of every care and attention, many cases of this terrible disease end in complete blindness.

Ilbert Hancock.
(*Revised by W. T. Lister.*)

OPIUM POISONING.—(*See* Drug Habit; Poisoning.)

OPTIC NEURITIS.—The treatment of optic neuritis depends upon the cause and its situation. When due to a general disease such as nephritis, appropriate constitutional treatment must be carried out and dark glasses should be worn.

When severe papillœdema is due to a recoverable intracranial tumour, such as a gumma or a tuberculous focus, in addition to general treatment decompression is indicated to relieve intracranial pressure lest atrophy supervene, with irremediable blindness.

Retrobulbar Neuritis.—When syphilis is the cause it must be treated energetically. Occasionally it follows empyema of the sphenoidal sinus. The nose and throat should therefore be carefully examined in all cases, and if there is evidence of such a condition it should be treated.

Where no specific cause can be found, the usual absorptive measures should be carried out: rest in bed, blisters to the temple, mercury inunctions, administration of iodides, combined with hot-air baths every other day.

W. Tindall Lister.

ORAL SEPSIS.

This is a condition in which there are present in the mouth one or more of the following:—

1. Pathogenic bacteria.
2. Bacteria capable of producing putrid decomposition of organic material.
3. Food débris.
4. Carious teeth, with their sequelæ—dental abscess, septic roots, etc.
5. Pyorrhœa alveolaris with its undrainable pockets among and around the roots of the teeth.
6. Tartar.

Oral sepsis is the result of local stagnation. Germs and food débris collect around the uncleansed teeth, and tartar is formed by the slow hardening of lime salts deposited from the saliva; the earliest deposit of tartar is soft and readily rubbed away.

Prevention of oral sepsis, as of dental caries, pyorrhœa alveolaris, and tartar, is wholly a matter of cleanliness. The entire intra-oral portion of each tooth must be cleaned at least once a day, beginning on the very day the tooth erupts. The neck of the tooth, where the gum embraces the tooth and forms the circumdental sulcus, is the most important seat of stagnation, especially interdentally. The interdental aspects of the teeth can best be cleaned by waxed silk thread, used so as to scour one surface of one tooth at a time.

Prevention also includes the avoidance of every artificial source of stagnation. All fillings must be well polished and be flush with the tooth surface at all their edges; gold caps, crowns, and the attachments of bridges must be so made that there is no overlapping of the artificial portion beyond the root or tooth, i.e., the join between crown or

gold cap and root must be flush in its whole circumference, and the point of junction should be as far from the gum edge as possible, i.e., as near to the grinding surface as possible.

TREATMENT.—Clear away all tartar; replace or polish down flush any faulty fillings; remove any ill-fitting gold caps, crowns, and bridges; extract every root or tooth which cannot quickly be rendered and kept aseptic; destroy all pyorrhœa pockets. Explain to the patient the importance of cleaning the *necks* of the teeth, and teach him to rub these and the edges of the gums with a piece of lint soaked in a weak antiseptic solution such as the following:—

℞	Sodii Bicarbonatis	gr x	Glycerini	℥j
	Acidi Carbolici	gr vj	Aquam	ad ℥j

and to use dental silk. If he is clever with his fingers he may be able, by means of a silver or gold tooth-pick (which can be bent to any angle, and 'flamed' to clean it), to pass between his teeth small rolls of cotton-wool soaked in the same lotion.

Before undertaking extractions in a septic mouth, some days should be spent in preparatory cleansing with mouth-washes and mechanically, every tooth, and especially the necks and interdental spaces, being well rubbed each day. *Joseph Geo. Turner.*

ORBITAL CELLULITIS may result from: (1) *Injuries*; (2) *Extension of the inflammation from surrounding structures*, e.g., periostitis, empyema of the accessory nasal sinuses, more especially the ethmoidal, etc.;* (3) *Metastases*, e.g., pyæmia, meningitis, etc.

TREATMENT.—In the subacute and chronic forms, surgical interference is seldom necessary. With attention to the bowels, hot fomentations, leeches to the temple, and quinine and iron internally, these cases generally end in resolution.

In the acute form, on the other hand, which is ushered in by a rigor, followed by fever, with great pain, brawny swelling of the parts, and marked proptosis, early operation is imperative to prevent extension to the meninges, and to save the eye from panophthalmitis or optic atrophy. It is not advisable to wait for the abscess to point, and its situation can often be inferred from the direction in which the eyeball is displaced. Thus, if the eye is displaced down and out, the abscess will probably be found up and in.

If there is no indication as to the position of the abscess, the incisions should be made through the skin of the upper and lower eyelid close to the orbital margin. A straight narrow bistoury must be used, and the knife plunged deeply into the tissues close to and parallel with the wall of the orbit, carefully avoiding the eyeball. Even if no pus is found, the operation, by relieving the tension of the parts, will often succeed in arresting the inflammation, speedy resolution following. The wounds must be efficiently drained, either by gauze or drainage tubes, until the discharge has entirely ceased, and hot fomentations applied until the swelling of the parts has subsided.

When orbital cellulitis is secondary to empyema of the accessory sinuses, it is important that an operator familiar with nasal surgery should be in charge, so that the sinuses may be treated at the same time as the orbital condition.

The general condition of the patient must be carefully attended to, and quinine and iron given internally. If panophthalmitis is present, the anterior segment of the eyeball should be completely divided and its contents evacuated. This is a safer procedure than enucleation, which may lead to meningitis from opening and infecting the vaginal sheath of the optic nerve. *Ilbert Hancock.*

(Revised by W. T. Lister.)

ORCHITIS.—(*See also* GONORRHŒA.) Acute orchitis is treated in the same way as acute epididymitis. If the testicle remains large and very tender, with some œdema of the scrotum and a raised temperature, or if there are recurrent attacks of tenderness, swelling, and fever without external cause, and the testicle does not return to the normal size between the attacks, an abscess may be diagnosed. The pus may be pent up under considerable tension in the interior of the organ, or there may be scattered abscesses.

---

* A careful examination of the nose and accessory sinuses should always be made with a view to eliciting the cause of the cellulitis, and guiding one in both the immediate and after-treatment.

The abscess should be opened as soon as possible, but if the testicle be destroyed by a large abscess or multiple abscesses, castration will be necessary. After incision of an abscess of the testicle, protrusion of the testicular substance (hernia testis) may take place. This eventually heals, sometimes after a large part of the testicle has been extruded and destroyed. *J. W. Thomson Walker.*

OSTEO-ARTHRITIS.—(*See* Rheumatoid Arthritis.)

OSTEOMALACIA.—In slight and early cases one may try the effect of phosphorus ($\frac{1}{100}$ gr. in pill thrice daily, increased up to $\frac{1}{20}$ gr. in each dose). Adrenalin solution, by injection, has also appeared to give good results in such cases. The dose is $\frac{1}{2}$ c.c. of a 1-1000 solution given subcutaneously at first every day, but afterwards twice a day. In severe or old-standing cases which are not complicated by pregnancy one should consider seriously the advisability of castration, as great improvement or even cure has resulted from the operation. It is best performed soon after a pregnancy. If the patient be actually pregnant when she first comes under observation, treatment will depend upon the condition of the pelvis. If it be deformed, the propriety of inducing abortion or of performing Cæsarean section later must be considered. If the pelvis be normal the case may be treated with phosphorus until after delivery. *Robert Hutchison.*

OSTEOMATA.—(*See* Bone, Tumours of; Jaws, Tumours of.)

OSTEOMYELITIS.—(*See* Bone, Inflammations of.)

OTITIS MEDIA.—(*See* Ear, Affections of.)

OVARITIS.—(*See* Salpingo-oöphoritis.)

OXALURIA.—The conditions which lead to an increased excretion of calcium oxalate in the urine are obscure, but in treatment it is important to forbid those articles of food which contain an excess either of calcium or of oxalic acid. Milk, eggs, jellies, tea, cocoa, sugar, green and root vegetables, and rhubarb should therefore be avoided, and the diet should consist of meat, fish, bread, rice and other farinaceous foods, butter, and coffee; potatoes and apples may be taken sparingly.

As magnesium oxalate is much more soluble than the calcium salt, it is advisable to give a small daily dose of a magnesium compound—30 gr. of the sulphate or carbonate or of calcined magnesia, daily, should be enough. Potassium citrate also increases the solubility of the oxalic acid by the formation of a double salt. The general health should also be attended to, regular exercise insisted upon, and any dyspepsia corrected. With the latter object, a mixture containing nitrohydrochloric acid after meals is often helpful. (*See also* Calculus.) *Robert Hutchison.*

PAGET'S DISEASE OF THE NIPPLE.—(*See* Nipple, Diseases of.)

PALMAR ABSCESS.—(*See* Abscess.)

PALPITATION.—Myocardial insufficiency, whether due to weakness of the muscle from anæmia, fatty changes, or want of tone, or to advancing sclerosis or valvular disease, is a common cause of palpitation. In such patients exercise is the usual exciting cause.

Nervous influences have also a powerful effect in its causation. Emotional stress, in nervous patients, may induce most serious attacks, and at the menopause, either natural or operative, palpitation is frequently most distressing, and the liability to it may extend over several years.

Reflex disturbances are also common causes of the disorder, the most common being flatulent dyspepsia, but almost any viscus may be responsible. Ovarian disease and floating kidney, for example, are well recognized as occasional exciting causes.

Coffee, tea, tobacco, and alcohol are often found to be causal agents.

It must not be forgotten that anything abnormal in the mechanism of the heart, especially if there is hypertrophy, is usually perceptible to the patient. Extrasystoles

and auricular flutter and fibrillation give rise to abnormal sensations, generally precordial in site; these are palpitation, a peculiar fluttering, or recurring thuds.

When palpitation is the result of definite disease of the myocardium or endocardium, it diminishes or disappears as the general vigour or tone of the heart improves. (*See* MYOCARDIAL FAILURE; *and* HEART, VALVULAR DISEASES OF.)

For the treatment of palpitation due to extrasystoles, auricular flutter, or fibrillation of the auricle, *see* HEART, IRREGULARITY OF.

The most valuable drugs in the treatment of palpitation when found in nervous patients, especially at the menopause, are the preparations of bromine. The following is a useful combination of hydrobromic acid, arsenic, and strychnine:—

℞ Acidi Hydrobromici diluti	℥xv	Liquoris Arsenici Hydrochlorici	℥iij
Liquoris Strychninæ Hydrochlorici	℥iv	Aquam Chloroformi	ad ℨss

A tablespoonful to be taken in water thrice daily after food.

Ammonium bromide is probably the most valuable preparation, and when combined with valerian is very helpful, both in the case of hysterical patients and also at the menopause.

℞ Ammonii Bromidi	gr. xv vel xx	Tincturæ Capsici	℥v
Tincturæ Valerianæ Ammoniatæ	ℨss	Aquam Menthæ Piperitæ	ad ℨss
Liquoris Arsenicalis	℥iij		

A tablespoonful to be taken in water thrice daily after food.

Strophanthus can be added to the above when thought desirable. Neurotic patients should avoid tea, coffee, and tobacco, and should give themselves a cold sponge down every morning on rising. If they prefer it, they can sponge themselves down while standing in tepid water; this minimizes the shock. The whole process should not take more than one minute, and should be followed by a vigorous rubbing of the skin.

In these nervous patients palpitation does not contra-indicate moderate exercise in the open air. The more they live in the open, and the more natural and simple their life, the better.

When there is reason to believe that the palpitation is due to a toxin such as alcohol, tea, coffee, or tobacco, the indications for treatment are obvious. The further use of the poison must be prohibited and general tonic treatment given. A prescription such as the following is useful:—

℞ Ferri et Ammonii Citratis	gr. vij	Tincturæ Cinchonæ Compositæ	ℨj
Tincturæ Nucis Vomicæ	℥vij	Infusum Gentianæ Compositæ	ad ℨss

One tablespoonful to be taken three times a day in water after food.

The palpitation of thyroidism demands above all things rest, both physical and mental, fresh air, and of course the medicinal and other treatment employed in Graves' disease. (*See* GOITRE, EXOPHTHALMIC.)

When the patient tends to be disturbed at night by palpitation, the last meal should be light, and no tea or coffee should be taken with it, and in such cases mental work should not be undertaken within an hour or two of retiring.

A draught containing ½ drachm of ammonium bromide in peppermint water is useful, taken at bedtime, or the more palatable effervescing preparation may be employed.

Where flatulence is the exciting factor, the condition of the stomach and intestines requires careful attention. The teeth must be investigated and the diet regulated, and the food must be well masticated and eaten slowly. When the feeling of distention is noticeable, a teaspoonful of the following mixture, well diluted, helps to relieve the distress:—

℞ Mentholis	gr. v	Spiritus Chloroformi	āā ℨss
Spiritus Ammoniæ Aromatici			

One teaspoonful well diluted with water to be taken when the flatulence is distressing.

In some patients sexual excess is very liable to bring on a tendency to palpitation; this should always be inquired into carefully, and the habits regulated accordingly.

John Hay.

PALSIES.—(*See* Birth Palsy ; Craft Palsies.)

PALSIES, CEREBRAL (of Childhood).—Under this heading are included the spastic paralyses of childhood, such as diplegia, hemiplegia, and so-called congenital spastic paraplegia. They divide themselves into three great classes :—

(1) *Those due to natal or pre-natal conditions ;* (2) *Those due to acute diseases*, with an onset in early childhood ; (3) *Those which are due to pathological processes*, slowly acting but progressive in character.

Cases belonging to groups 1 and 2 tend to improve ; those belonging to group 3 tend to run a progressive downward course.

1. The cases due to natal or pre-natal conditions show an amount of paralysis and rigidity ranging from a slight spastic condition of the legs to a condition of extreme hyperextension or hyperflexion of the legs, inward rotation of the arms, and retraction of the head. In the latter case, but little can be done to relieve the symptoms ; in the former, patience and perseverance may accomplish much.

Children suffering from this affection commonly come under observation during the second year of life, owing to their inability to walk ; such a child may show other signs of cerebral and mental deficiency, but in many cases the condition is limited to the lower extremities.

Treatment is simple, but must be continued over a long period. It must in the first instance be directed to remove the rigidity which is present ; this is accomplished by regular *passive movements*, which have for their object the overcoming of the spasmodic contraction of certain muscles. As a rule the adductors of the thigh are markedly contracted, and abduction and rotation outwards of the thighs are movements of especial importance. Again, the foot tends to assume a position of equinus, with which is often associated some cavus. Dorsiflexion movements of the foot are especially required in such a case. Warm baths preceding the passive movements are often of the greatest service. These movements should be carried out twice a day, and for periods of fifteen to thirty minutes.

No less important are the *resistance movements* which a child can usually be taught to perform. These are carried out by making the patient alternately flex and extend the leg against the resistance of the hand. Co-ordination is educated by making the child perform exercises similar to those described by Fraenkel. For the legs, a double board with round holes at a distance of 3 to 4 inches, into which the heel can be placed, serves for simpler forms of exercises. For the hands, a solitaire or cribbage board, on which the pegs are moved up hole by hole, is all that is required. Simple rubbing is useful, but is not nearly so important as the exercises above indicated.

The child should be encouraged to walk, and considerable aid may be obtained by a walking apparatus with a sufficiently broad base and easily running wheels. Tenotomy may be required in some cases. Light celluloid splints will often serve to keep the limb in the normal position, and a splint of some kind is required in all severe cases, whether a tenotomy is performed or not. Faradism, galvanism, and various forms of electrical treatment are of little service. Drugs also are of little use except to meet special symptoms.

A form of treatment first recommended by Förster is that of section of some of the posterior roots in the lumbo-sacral region of the cord. The roots generally selected are the 2nd, 3rd, and 5th lumbar and the 2nd sacral. The section of these roots abolishes the hypertonicity of the muscles. A great deal of care is necessary in the selection of suitable cases for this operation. In cases with but slight spasticity the operation is *entirely* unnecessary, and good and better results can be obtained with tenotomies and exercise. In the severer cases, it is important to find out what amount of voluntary power exists ; if this is good, the abolition of the spasticity will allow a freer and wider range of movement ; but if voluntary power is deficient, the section of the posterior roots will cause a flaccid paralysis in the place of a spastic paralysis—a result not to be desired. It must be borne in mind that spasticity and voluntary powers are quite distinct functions of the nervous system, and the presence of spasticity does not mean that voluntary power is present. It is useless to perform this operation in cases in which the mental condition of the child is bad ; it must, however, be remembered that the mental condition will greatly

improve under careful instruction; and an opinion with regard to it should only be expressed after a careful, quiet, and, if necessary, repeated examination.

Nerve section is a useful procedure in selected cases, as, for instance, those with severe adductor spasm. The obturator nerve may be injected with alcohol so as to abolish its conductivity, and this gives rise to an adductor paralysis of some months' duration. Whilst recovery is taking place, the abductors are exercised and the balance of power restored.

For the more severe cases, in which there are retraction of the head and marked rigidity, with hyperextension of the limbs, very little can be done in the way of treatment, and it is a matter of careful nursing to keep the skin of these children free from sores.

2. In the second class of case, in which the cerebral condition has followed on some acute disease, treatment should be carried out on the lines laid down for cases in group 1, but with even more prospect of success, and especially in those cases in which the cerebral or cerebellar lesion is due to the virus of poliomyelitis.

3. For the third group little or nothing can be done to arrest the progress of the disease. In cases due to specific disease, salvarsan, mercury, and iodide may be given; the latter drug in drachm doses three or four times a day has been recommended. I have tried these large doses, and there is no difficulty in giving this amount, but I have never seen any beneficial result follow. Mercurial ointment should be rubbed into the calves of the legs every day for fifteen minutes. Cases presenting hemiplegic symptoms are treated in a similar manner to those presenting bilateral symptoms.

F. E. Batten.
(Revised by Edwin Bramwell.)

PANCREAS, DISEASES OF.

Acute Pancreatitis.—It is but rarely that this condition is recognized before operation, which is usually carried out on the diagnosis of perforation of a peptic ulcer. On opening the abdomen, blood-stained fluid escapes, and there is a characteristic slimy feel about the omentum, pointing unmistakably to fat necrosis.

Fat necrosis is not pathognomonic of acute pancreatitis; it simply denotes the escape of the pancreatic ferments, and may occur, as first pointed out by the writer, in perforation of a duodenal ulcer.

If the pancreas is tensely distended, it may be incised in a direction parallel to the duct. The gall-bladder and bile-ducts should be carefully investigated; they should be drained if stones are found. In rare cases an abscess may form as the result of acute inflammation; this should be drained through an incision in the costovertebral angle.

Chronic Pancreatitis.—This is usually secondary to disease in the gall-bladder. In these cases, removal of gall-stones and drainage of the gall-bladder is usually sufficient. Occasionally, on closure of the drainage opening, the symptoms, shivering and jaundice, recur, necessitating further operation.

There is a group of cases in which the symptoms are those of an obstructive jaundice with distended gall-bladder, difficult to diagnose from malignant disease even at operation. In this group, the gall-bladder should be united to the duodenum (cholecyst-duodenostomy), or failing this to the stomach (cholecyst-gastrostomy). The writer has seen no evil results from this latter procedure, which he has carried out on several occasions. In the group in which the symptoms are those of interference with pancreatic secretion only, I do not think drainage of the gall-bladder is likely to benefit.

Pancreatic Calculi.—If situated in the head of the gland these should be removed by incision of the anterior wall of the second part of the duodenum, opening up the ampulla of Vater. If in the body of the gland, they can be removed by direct incision.

Pancreatic Cysts.—In a few cases it is possible to excise these; the majority must be drained. The incision should be made over the most prominent part of the swelling, which is usually reached between the stomach and transverse colon. After aspirating the cyst, the edges of the opening should be fixed to the abdominal wall, usually, from the situation of the incision, to the posterior sheath of the rectus, and drained by tube.

Tumours of Pancreas.—In the majority of cases these are carcinomatous. A few sarcomata have been successfully removed. At the present time, operative treatment of carcinoma is limited to cholecystenterostomy for the relief of the jaundice.

James Sherren.

PAPILLOMATA.—(*See* WARTS.)

PARALYSIS AGITANS.—This is an affection which severely taxes the resources of the physician. The disease pursues a very chronic course. The symptoms may remain stationary for long periods of time, but it is very doubtful whether an actual 'cure' has ever been effected. While there is no conclusive evidence that any of the therapeutic measures hitherto employed have permanently arrested the disease, it is at the same time to be remembered that the very chronic course it pursues renders judgement as to the effects of remedies upon its progress extremely difficult.

Treatment consists in attention to the general hygiene, and the avoidance of influences which have been observed to exert a deleterious effect, together with the administration of drugs, and the adoption of other therapeutic measures which have been found by experience to benefit the individual symptoms, and may perhaps help in retarding the progress of the disease.

The patient should lead a quiet, restful life, free, as far as possible, from excitement and all cares and business worries. Fresh air seems undoubtedly beneficial; an outdoor life, with exercise graduated to meet the individual's capabilities, is therefore to be recommended. A carriage drive, it is worthy of note, will often assist materially in lessening the patient's discomfort for the time being.

Alcohol and stimulants, such as strong tea and coffee, are to be avoided. A glass of whisky and hot water at bedtime may, however, be permissible in cases of sleeplessness. A warm, but not very hot, bath sometimes has an appreciably soothing effect upon the subjective symptoms.

In the later stages, restlessness, and an inability to remain for any length of time in one position, are among the most troublesome manifestations of the disease. A hard bed, by enabling the patient to alter his position more easily, will be found preferable to a feather mattress when these symptoms exist. Gentle massage often helps to allay discomfort in the affected limbs. Observers are almost all agreed as to the uselessness of electricity in this disease, although Oppenheim has seen some benefit from weak bipolar faradic baths.

Distinct benefit may accrue from exercises, as Friedlaender has pointed out. Thus, in early cases, where the tremors can be for a short time arrested, the patient should practise his power of voluntary control two or three times a day for five to ten minutes at a time. Temporary lessening of the tremor, and, it may be, after a time a more permanent beneficial effect, are sometimes attained in this way. The same author strongly advocates the value of slow passive movements of extension at the various joints. The limb should be fixed, and while the patient does his best to relax his muscles, the operator carries out five to ten movements at each joint. Even in severe cases, improvement may be obtained by this procedure. Active movements of the extensor muscles against varying degrees of resistance, carried out systematically with the purpose of overcoming the flexor rigidity, will also be found of service. Again, the patient's attention should be directed to the necessity of constantly trying to correct the abnormal attitudes which the limbs, head, and trunk tend to assume. While walking, for instance, he should pause after each step and extend the trunk and vertebral column as the advancing foot is placed upon the ground, and should practise at the same time taking longer steps. Great improvement cannot be expected from these exercises, but the amount of benefit which may be derived thereby is ample justification for their systematic use.

Suspension, nerve stretching, and the 'jolting chair' of Charcot, are methods of treatment which are no longer employed.

Many drugs have been credited with producing benefit in this disease, but few have justified their vaunted reputation.

Arsenic is a medicinal remedy which is generally regarded as of some service. Fowler's solution, 2 min. three times a day, the dose being gradually increased to 8 or 10 min., is the usual method of administration. If an arsenical erythema or gastro-intestinal symptoms appear, the dose should be reduced. Pigmentation of the skin may be produced when arsenic is given in large doses. Where it is deemed desirable to continue the administration of large doses, the possible development of an arsenical neuritis is to be kept in view.

Strychnine is another drug which appears in some cases to do good. It may be combined with arsenic, or it may be given as Easton's syrup, beginning with a dose of half a teaspoonful three times a day, and gradually increased.

The merits of hydrobromate of hyoscine, originally recommended by Erb, in this disease, have been advocated by Williamson, who points out that this drug diminishes the tremor and general restlessness, while the patient often sleeps better during its administration. The writer's experience corroborates the efficacy of this remedy. Williamson advises that the drug be given in chloroform water, commencing with an initial dose of $\frac{1}{150}$ gr., which may be gradually increased up to $\frac{1}{100}$, or even *with due caution* to $\frac{1}{50}$ gr. two or three times a day. The same preparation of hyoscine should be used, to ensure constancy.

℞ Hyoscinæ Hydrobromatis gr. $\frac{1}{8}$ | Aquæ Chloroformi ℥vj

Two teaspoonfuls twice a day, the dose to be increased as directed by the physician.

The first dose should be given after breakfast, the second shortly before the patient retires to rest. The action of the drug appears to wear off in a few days, but if it is discontinued and again renewed, the effect is usually as marked as at first. The dose should be reduced if dryness of the mouth supervenes. Hyoscine sometimes produces gastric symptoms which interfere with its administration.

A patient, recently seen by the writer, who had suffered from pronounced tremor and had been taking hyoscine for years, when he wished to steady his hand in order to sign his name was in the habit of taking 10 gr. of barbitone.

Sulphate of hyoscyamine ($\frac{1}{100}$ gr.) and sulphate of duboisine ($\frac{1}{75}$ gr.) are, it is affirmed, sometimes of benefit. For pains in the limbs which are giving rise to discomfort, phenacetin or some of the other analgesics may be employed. (*See also* Cramp.)

Edwin Bramwell.

PARALYSIS, VOLKMANN'S ISCHÆMIC.—(*See* Volkmann's Ischæmic Paralysis.)

PARAPHIMOSIS.—This is a complication of phimosis, and denotes an inability to draw the prepuce forwards over the glans after it has been retracted. Balanitis is a frequent cause of the narrowing and rigidity of the preputial orifice. The condition is seen in childhood as well as in adult life. The tight ring formed by the preputial orifice may be immediately behind the corona, but is more commonly found a little further back, and is then separated from the corona by a roll of œdematous mucous membrane. If left untreated, ulceration of the tight ring of tissue takes place. The condition may be relieved, but sloughing of the mucosa, and even of the glans, may take place.

Treatment.—The glans must be reduced through the narrow preputial orifice. Russell Howard suggests the application of a cold-water bandage to the glans for a few minutes before attempting reduction. In cases seen early this can usually be accomplished by pulling the prepuce forward by grasping the penis between the first and second fingers of each hand, while the thumbs press on the glans, reducing the swelling and forcing it backwards. An anæsthetic may be necessary. In more severe cases, the collar of œdematous mucosa in front of the constriction may need puncturing in several places to reduce the swelling, while in others the constricting ring will require division on the dorsum of the penis before the prepuce can be unrolled and drawn forwards. Circumcision should be performed after the parts have been given a few days in which to recover, frequent syringing being made use of meanwhile. *H. A. T. Fairbank.*

PARAPLEGIA.—(*See also* Neuritis; Poliomyelitis; Palsies of Childhood.) Paraplegia may be due to many causes, the nature of which, in conjunction with the special characters of the paralysis, will determine the treatment of the individual case.

The treatment of paralysis of the lower limbs consequent upon disease of the peripheral nerves, of acute anterior poliomyelitis, and of the spastic paraplegias of childhood (Little's disease), is dealt with in special articles.

A rapid survey of the paraplegias from a pathological standpoint is necessary as an introduction to our subject.

Conduction in the spinal cord may be interfered with or abrogated by lesions within its substance, such as acute myelitis, hæmorrhage, tumour, syringomyelia, and disseminated sclerosis.

Again, pressure upon the spinal cord may interrupt the transmission of impulses to and from the parts below the level at which the cord is pressed on. Among the lesions which may be

instanced in this connection are malignant and simple tumours growing from the spinal membranes or from the bone, hydatids, pachymeningitis (whether syphilitic, tuberculous, or simple), tuberculous disease of the spine, and aneurysm of the abdominal aorta which has eroded the vertebral bodies and invaded the spinal canal.

Further, the paraplegia which results from direct violence in association with a fracture-dislocation of the spine may with advantage be separated from the pressure paraplegias just referred to.

Another group includes those cases in which the paraplegia is dependent on systemic disease, affecting primarily the motor neurones, although, in addition, other tracts may be involved. Examples of this type are to be found in amyotrophic lateral sclerosis, the combined degenerations of the spinal cord, familial spastic paralysis, etc.

Lastly, there are the hysterical paraplegias. In this connection, cases in which a functional paralysis is superimposed upon a recovering organic paralysis are deserving of special mention, since their true nature is especially apt to escape detection.

The type of the paralysis may vary. Thus, a paraplegia is often referred to as spastic or flaccid, according to the presence of spasticity or flaccidity in the paralyzed limbs. Since the character of the paraplegia is important in relation to treatment, a few words in explanation of these terms are necessary.

The spinal centres for the movements of the lower limbs are situated in the lumbosacral region of the spinal cord (L2 to S2); hence any lesion which destroys this region will produce a flaccid paralysis of the lower extremities associated with wasting of the muscles, impairment or loss of their electrical excitability, and abolition of the reflexes in the region of the body supplied from the segments which are destroyed. On the other hand, if the lesion is situated at a higher level—in other words, if the pyramidal fibres and not the spinal centres are implicated—a condition of muscular spasticity, with increase of the deep reflexes, is met with. If, however, the lesion is so complete as totally to interrupt upward and downward conduction through the cord, notwithstanding that the lumbosacral region of the cord remains intact, a flaccid palsy, with wasting, impaired electrical excitability, and abolition of the deep reflexes, results. For instance, in cases of complete localized destruction of the spinal cord due to a fracture-dislocation of the spine, this form of flaccid paraplegia is met with. Cases may be observed in which a tumour pressing on the cord at first produces a spastic paralysis, the spasticity gradually increasing until conduction in the cord becomes impossible, when a flaccid palsy takes the place of the previous spastic state.

At this juncture it will be convenient to refer to certain of the paraplegias, the causative treatment of which calls for special emphasis.

The Primary Treatment (Treatment directed against the Cause).—From the preceding remarks it will be seen that treatment of paraplegia necessitates a recognition of its cause. This may at once be obvious; on the other hand, the solution of the diagnostic problem may be attended with the greatest difficulty, and is sometimes, especially in the early stages of a case, impossible. If the physician is unable to come to a positive conclusion as to the exact nature of the case, he must at least attempt to exclude those various forms of paraplegia which urgently demand a special line of treatment.

If the paraplegia is *hysterical*, and if, as the result of a confident opinion as to the absence of organic disease, no immediate improvement takes place, the patient should be promptly removed from her relatives and treated in isolation by psychotherapeutic methods, either in a hospital ward or nursing home. Decisive measures are to be adopted from the first if a good result is to be obtained, for dilatory temporizing diminishes the prospect of cure in these cases. Needless to say, the measures above advocated are only to be adopted when the physician is perfectly certain of his diagnosis.

When there is evidence of syphilis, a course of mercurial inunctions and potassium iodide internally should be immediately instituted. Details as to the method in which these drugs are to be administered will be found in the article on syphilis. Here, again, temporizing is inexcusable. Potassium iodide should be given in doses of 10 to 15 gr. three times a day in combination with mercury, and rapidly increased until 90 gr. are taken in the course of the twenty-four hours. If a gumma or gummatous meningitis is responsible for the symptoms, the beneficial effects of treatment will probably be evident in the course of a few days. Even should the symptoms entirely disappear, the possibility of their recurrence must be kept in view, and the remedies continued in smaller doses, with intermissions, over a considerable period. The amount of improvement which follows in a case of syphilitic paraplegia, even when the paralysis is of considerable standing, is often most surprising if the remedies are continued over a long period. In some of these cases salvarsan or its substitutes give excellent results. The drug should be given intravenously, in doses of 0·4 to 0·6 grm. This dose may be repeated six to ten times, at intervals of a week, according to the results produced.

Is the spinal cord pressed on by a *tumour*? If so, is the neoplasm a secondary deposit? Is it a malignant tumour growing from the membranes or the bone? or is it a localized simple growth arising from the membranes? When the facts point towards the latter diagnosis, and if syphilis can be excluded, the question of operation must be carefully considered, and without delay, for it must be remembered that, as a consequence of pressure, a softening of the area of cord in immediate relation to the tumour may at any time take place, after which no relief of symptoms is to be anticipated as a sequel to removal of the tumour. In any case of progressive paraplegia, associated with severe pain in the back which corresponds to the upper level of the symptoms, with, it may be, root pains, and especially if there is a tendency to the Brown-Séquard syndrome, an abdominal aneurysm and syphilis having been as far as possible excluded, and there being no evidence of disease of the bone or of tumours elsewhere, an operation should be undertaken without delay, provided that there are no special contra-indications. The brilliant results which have been obtained in a large number of cases by the removal of a simple tumour pressing on the cord, afford ample justification for this procedure *in any case of progressive paraplegia in which there is a distinct possibility that the symptoms may depend upon a growth of this nature.* In some of these cases the operator may find localized tuberculous disease of the bone of which there was no previous indication, in others tuberculous granulation tissue or a pachymeningitis, or he may meet with an extensive and irremovable sarcoma; but the possible presence of these lesions constitutes no contra-indication to the surgical procedure. It is not proposed to consider here the segmental location of the tumour; on this point, and that of vertebrospinal topography, the reader must consult special neurological and surgical works; but it may be noted that the constant tendency is to locate the tumour rather too low than too high in the spinal canal.

Tuberculous disease of the spinal column, often apparent at the first glance, is in some cases extremely difficult or impossible to distinguish from the other forms of pressure paraplegia, and notably from tumour. The condition having been diagnosed, if there is no evidence pointing to a tuberculous abscess as the cause of pressure, absolute rest in bed is to be enjoined. Extension should be applied, with counter-extension to the head if the disease is situated in the cervical region. (*See* SPINE, CARIES OF.) If there is reason to suspect a tuberculous abscess as the cause of the paraplegia, it is probable that operation will prove the only effective mode of treatment. It is especially in the case of children that a favourable result is to be anticipated as a consequence of operation in these cases. Caries sicca (dry caries), a condition which occurs specially in adults and elderly people, is very occasionally benefited by operation.

The *traumatic paraplegia* associated with fracture-dislocation of the spine deserves notice, since operation is attended with some hope of relief, if it so happens that the cord is pressed on by a piece of bone which is removable. Operation is probably justifiable when, in a case of incomplete interruption, after six weeks there is no further improvement.

The paraplegias which result from systemic disease, syringomyelia, and disseminated sclerosis depend upon pathological processes which are but little influenced by treatment.

In cases of *hæmorrhage* and *acute myelitis*, it has been suggested on theoretical grounds that the patient should be placed in the prone position until the acute process has ceased to progress. It is doubtful, however, whether the problematical advantage which results compensates for the discomfort which attends this unnatural posture.

Ice applied over the situation of the lesion is recommended by most authorities in cases of acute myelitis. A sponge-bag filled with ice will be found convenient for this process. It is improbable that ergot is of any use in arresting the inflammatory process in a case of acute myelitis; if, however, hæmorrhage has been diagnosed, or even if its presence is suspected, full doses of this drug may be administered with possible advantage. When there is much pain, as there is very apt to be in cases of hæmorrhage, 10 gr. of phenacetin may be given. Should this prove ineffectual, $\frac{1}{4}$ gr. of morphia, injected subcutaneously, will probably bring relief.

Small doses of iodide of potassium (5 to 10 gr.) may be administered internally, in the hope that they may aid in promoting absorption of the inflammatory products.

Symptomatic Treatment.— Under this heading it is proposed to describe the measures to be adopted in the symptomatic treatment of a case of paraplegia more or less irrespective of its origin.

In cases of *paraplegia of acute onset*, certain precautionary measures are at once necessary.

1. In the event of the patient being unable to pass urine, as is usually the case, the next point to determine is whether the bladder is distended. If there is distention of the bladder, the *urine should be at once drawn off* with the strictest aseptic precautions. A catheter is to be passed four or five times a day until the bladder begins to evacuate itself automatically. Statements to the effect that urine is being passed are to be accepted with caution, since an overflow incontinence may delude the patient into believing that all is well.

2. The patient should at once be placed upon a *water bed*, with the special object of avoiding bed-sores.

In order to prevent the development of bed-sores, it is of primary importance that the patient should be kept absolutely dry and clean. If there is incontinence of urine, the patient should be provided with a receptacle for the urine. Care is to be taken in the case of male patients that a trophic ulcer does not form on the penis in consequence of pressure. The buttocks and back should be carefully washed with soap and water at least twice a day; methylated spirit is then to be rubbed into the skin, which may afterwards be dusted with some bland non-irritating powder. The heels may be allowed to lie in nests of cotton-wool as an additional precaution against bed-sore formation. The danger of burns as a consequence of hot bottles coming in contact with the insensitive skin is to be borne in mind.

The nursing of these cases requires the greatest care, and whenever practicable the services of two trained and intelligent nurses should be secured. In the treatment of acute paraplegia, the recognition of the 'mass-reflex' of Head and Riddoch, and of its significance, is of essential moment. The following indications are largely culled from Riddoch's paper (*Lancet*, Dec. 21, 1918, p. 839), which is based on his unique experience of traumatic paraplegia at the Empire Hospital during the war. For a few days to three weeks after the incidence of a spinal injury (or acute transverse lesion), the spinal cord distal to the lesion is under the influence of shock. The muscles are flaccid, the reflexes are abolished, the skin is dry, and there is retention of urine and fæces. Gradually reflex excitability returns, the bladder expels its contents at intervals, and the rectum becomes automatic in its action. In certain cases a scratch, a prick, or even a touch applied to the paralyzed parts produces a violent spasm of the flexor muscles and of the muscles of the abdomen, with evacuation of the bladder. Automatic evacuation of the bladder or rectum may, conversely, evoke a flexor spasm. This, the so-called 'mass-reflex', is most readily set up when the stimulus is applied to the soles of the feet, the external genitals, and the anal region. When present, the 'mass-reflex' is a source of constant discomfort to the patient and gives rise to difficulty in nursing. Its occurrence may be minimized, however, by intelligent attention. The bladder tends to evacuate itself involuntarily every two to four hours. About the time this is to be expected, the patient or nurse may initiate a flexor spasm by stimulating the abdominal wall or lower limbs, with a result that complete emptying of the bladder is assured. Again, abdominal distention and discomfort are often complained of by these patients, accompanied, it may be, by nausea, and usually attributed to flatulence. Although these symptoms may denote a commencing attack of pyelitis, they are often, according to Riddoch, due to the flexor spasm exciting the reflex visceral arcs. Consequently they may be minimized by suitable precautions. Thus, when giving enemata, the fluid is to be injected slowly and distention of the rectum avoided; when passing the catheter, the instrument is to be introduced slowly, the penis is to be held gently, non-irritating antiseptics are to be used with which to wash the external genitals, and the patient is to be carefully handled, those positions least favourable for involuntary movements being noted. Excessive sweating, which may give rise to great discomfort and is apt to interfere with sleep, may often be avoided or minimized by such precautions. When this is not the case, liquor atropinæ 1 to 2 min., given in water about 8 or 9 p.m., is often helpful (Riddoch). Flexor spasms of the limbs are often very distressing. These may sometimes be relieved for a time by placing the patient on his side or by propping him up in bed in a semi-sitting position with the legs somewhat flexed and supported under the knees by pillows, the feet being kept up by a foot-rest. Urinary sepsis, dyspepsia and intestinal disturbances, inflammation of the prepuce or skin of the scrotum, and

bed-sores are often exciting factors in this connection calling for appropriate treatment. In the treatment of clean bed-sores, Riddoch recommends an ointment containing benzoin or zinc; while if the bed-sores are septic or sloughing, fomentations should be applied four-hourly. Thereafter, so long as the sore is discharging, it may be cleaned with eusol 1–6000 to 1–8000, or liquor sodæ chlorinatæ (B.P.), or liquor ammonii acetatis 2 per cent, and dressed with gauze wrung out of the solution morning and evening. When unhealthy pale granulations appear, the fomentations should be stopped, and healing may be promoted by the application of stimulating solutions such as red lotion, Friar's balsam, or liquor argenti nitratis 1 or 2 per cent.

Pain in the back is sometimes relieved by the application of the Corrigan button over the spine in the region where it is experienced. In some cases of malignant disease of the vertebral column the pain is so severe that the condition well deserves the epithet 'dolorosa' which has been applied to it. There is no object in withholding morphia in the treatment of those cases in which a fatal termination is to be looked for in the near future.

One of the most common causes of death in cases of paraplegia is the development of a cystitis, with a subsequent spread of the infection to the kidneys, producing a pyelonephritis. Should cystitis exist, the bladder should be washed out two or three times a day with weak boracic lotion, or eusol 1–16,000, while suitable remedies, such as salol, hexamine, and acid phosphate of soda, may be given internally, as indicated by the condition of the urine. Other associated lesions and complications, such as anæmia, are to receive the necessary treatment which their presence demands.

In cases of *chronic paraplegia*, or in those of sudden onset in which the acute stage has passed off, the patient should be given every encouragement to use his limbs, with due caution as to the avoidance of fatigue.

When the paraplegia is of the flaccid variety, a consequence of destruction of the lumbosacral cord or nerve-roots of the cauda equina, the paralyzed muscles should be massaged every day. The application of faradism—or, if the muscles will react only to galvanism, the latter form of electricity—may be recommended as soon as the acute process has passed off. Strychnine may be given hypodermically with advantage in the flaccid paraplegias, although contra-indicated where spasticity exists.

Cases of paraplegia dating from birth, in which difficulty in walking is due to muscular rigidity rather than to want of power, have recently been submitted to operation. Division of a number of posterior spinal roots has been followed, in several instances, by pronounced diminution in the muscular rigidity and corresponding improvement in locomotion. This operation is only indicated when spasticity is the cause of the inability to walk, and when there is good reason for believing that abolition of the spasticity will enable the patient to get about fairly satisfactorily. (*See also* ELECTROTHERAPEUTICS, *and* SPINE, CARIES OF).

Edwin Bramwell.

PAROSMIA.—The majority of patients who seek advice because of an unpleasant smell in the nose will be found to be suffering from some local disease. The most careful examination must be instituted to discover any cause, such as suppuration in the accessory sinuses (especially in the antrum), syphilitic ulceration, necrosis, or a foreign body. The mouth, throat, and even the lungs must be examined as a possible source of the trouble. The chief causes of true parosmia are hysteria, neurasthenia, influenza, and central nervous diseases. The treatment must be directed towards the removal of the cause, and combined with appropriate general measures. The prognosis in the majority of cases is good.

H. Lambert Lack.

PAROTID, TUMOURS OF.—(*See* SALIVARY GLANDS, AFFECTIONS OF.)

PAROTITIS.—(*See* SALIVARY GLANDS, AFFECTIONS OF; MUMPS.)

PAROXYSMAL RHINORRHŒA.—(*See* HAY FEVER.)

PAROXYSMAL TACHYCARDIA.—(*See* TACHYCARDIA.)

PAVOR NOCTURNUS.—(*See* NIGHT TERRORS.)

PEDICULOSIS CAPITIS.—It is not enough to bring about the destruction of the living pediculi. That is easy, and may be accomplished by the free application of any antiseptic, or by simple prolonged soaking in water. If the embryos in the nits are not also destroyed, any relief is only temporary. The best and surest method of cure is the application of common paraffin oil. It is not advisable to wash the head before beginning this treatment, as the removal of the natural grease from the scalp makes the application needlessly painful: the pediculi are in the hair, not in the skin. Further, to avoid unnecessary pain, the skin at the nape of the neck, and behind the ears, should be liberally smeared with lard or zinc ointment. The hair is then soaked (at night) with the oil, and strips of rag, dipped in oil, are plaited up with the hair into a chignon, over which a bathing-cap is applied. The soaking is repeated, morning and evening, on the next day. On the following morning the head is washed with soap and water. If these directions are faithfully carried out, one may feel confident of the destruction of all the embryos, and thus of complete cure. Oil of sassafras may be substituted for paraffin. The nits still remain adherent to the hairs in large numbers, acting as unpleasant reminders of the past. Many methods for their removal have been recommended; probably the best is the diligent use of the old-fashioned tooth-comb dipped in warm vinegar. *Norman Walker.*

PEDICULOSIS CORPORIS.—The pediculus corporis, though usually found on the vestments, deposits its eggs also on the fine downy hairs of the trunk, and it is therefore not sufficient to disinfect the clothes and bathe the patient. In addition to these most desirable procedures, some antiparasitic ointment, such as sulphur or stavesacre, must be thoroughly applied to the body surface for two or three days. Allan Jamieson recommended that elderly persons whose habits are such as to 'predispose' to pediculosis should wear a little bag filled with sulphur, like a charm, round the neck. The vapour of the sulphur is repulsive to the pediculus. *Norman Walker.*

PEDICULOSIS PUBIS.—The crab-louse does not restrict itself absolutely to the region which is suggested by its scientific name, but is found occasionally on the hairs of the axillæ, eyebrows, and eyelashes; in these latter situations, only in greatly neglected children. In the usual situation on the pubis, it is easily destroyed by the regular application of some antiseptic ointment. Blue ointment, the usual chemist's prescription, is not a desirable antiseptic to use, for two reasons: first, the readiness with which the mercury is absorbed into the system from this warm moist region, and second, the frequency with which a mercurial dermatitis is set up. This, in its turn, causes irritation; the unfortunate victim attributes this to the pediculi, and in his anxiety he applies more and more of the ointment, which has probably already destroyed the parasites, and now merely aggravates his sufferings. White precipitate ointment is as efficacious and less injurious; warm vinegar, with a little sublimate, is a favourite application in France; and in very severe cases the parts may be shaved. *Norman Walker.*

PELLAGRA.—The treatment of this disease has from time to time varied, according to the particular hypothesis of the etiology which has been in vogue. It is now considered by most authorities to be due to some dietetic deficiency, presumably a protein starvation. In the *early* stages of the disease, undoubted benefit is to be derived from a liberal protein diet, consisting of eggs, fresh milk, and fresh meat. When the disease process has progressed, when the nervous and cutaneous symptoms are severe, and especially when signs of mental degeneration have set in, it is doubtful whether dietetic measures exert any effect whatsoever. The diarrhœic symptoms which so frequently accompany pellagra require attention; they are often due to a superimposed dysentery. Malaria and ankylostomiasis are also frequent complications, and require special treatment. If pellagra is accompanied by severe anæmia, arsenic, in the form of Fowler's solution, in 2- to 3-min. doses, is useful. *P. Manson-Bahr.*

PEMPHIGUS.—True pemphigus is a very grave disease, and fortunately, for treatment is far from satisfactory, a rare one. Arsenic is the most useful remedy, and should be given as freely as the patient's general condition permits. As soon as it has obtained control of the disease, the dose should be reduced till just enough is given to maintain

the improvement. No other drug has so specific an influence as arsenic, but strychnine and other tonics are sometimes useful when, for one reason or another, one is compelled to suspend the administration of arsenic. The cacodylate or other organic compounds of arsenic may be tried, but their effects are just the same as those of arsenic, while they impart a very marked garlic odour to the breath. In one case under the writer's care the administration of soamin (one of the modern synthetic arsenical compounds) was followed by complete and permanent blindness. Similar disasters have been recorded in connection with other like preparations, and he has accordingly ceased to use any of them.

Local treatment consists in letting the contents out of the bullæ, and the application of some simple antiseptic ointment; but if it is feasible, the patient's chances of recovery are greatly aided by continuous immersion in a weak antiseptic bath, kept just above the normal body temperature. Cases of pemphigus should always be sent to, and always admitted to, a hospital. *Norman Walker.*

PERICARDITIS.—(*See* Rheumatism, Acute.)

PERICOLITIS.—(*See* Diverticulitis of Colon.)

PERIOSTITIS.—(*See* Bone, Inflammations of.)

PERIPHERAL NEURITIS.—(*See* Neuritis; Paraplegia.)

PERITONITIS, TUBERCULOUS.—In this, as in all forms of tuberculosis, hygienic treatment is of the first importance. Whilst active symptoms (e.g., fever) are present, the patient must be confined to bed, but care should be taken to see that he gets as much fresh air as possible, and as soon as may be he should be taken out of doors. If the patient be a child, he can be wheeled about in an invalid perambulator, preferably by the seaside—Margate and Broadstairs being specially suitable localities.

The diet should be abundant, and should contain plenty of the more easily digested forms of fat, such as bacon, butter, and cream, besides minced meat, pounded chicken or fish, eggs, and abundance of good milk. Unless the latter can be guaranteed to be free from tubercle bacilli it is safer to boil it. Starchy foods should be given sparingly.

Locally, ½ drachm of one of the following preparations should be rubbed into the abdomen night and morning: equal parts of iodoform ointment and olive oil, oleate of mercury ointment (10 per cent), linimentum hydrargyri, blue ointment, or croton oil. The abdomen should also be covered with a firm flannel binder.

Internal medication must first be directed to the state of the bowels. If, as is so often the case in children, there be a tendency to diarrhœa with offensive motions, 1 min. tinct. opii should be given for each year of the child's age, three times a day, along with full doses of bismuth or chalk. When the diarrhœa has been overcome, cod-liver oil or oil and malt may be given, and, if there be anæmia, 20 min. of glycerinum ferri iodidi thrice daily. Small doses of arsenic are also useful. Guaiacol carbonate or creasote may be given (*see* Phthisis), or iodoform (though cautiously). The following is a convenient formula for the administration of the latter:—

℞ Iodoformi	gr. ss	Emulsi Olei Morrhuæ	q.s. ad ℥j
Tincturæ Lavandulæ Co.	℥viiss		

If pain be troublesome, Dover's powder (4 gr. thrice daily for a child of five) is the best analgesic.

Ascites need not be interfered with in acute cases unless it is causing distress. It is then most safely dealt with by incision.

If, after a persevering use of these measures for six weeks, no improvement is observed, the propriety of surgical interference should be considered; but it must be pointed out that the results of medical treatment are, on the whole, so satisfactory that operation is less often resorted to in such cases now than formerly. The cases most favourable for operation are those in which there is considerable ascites. In such circumstances evacuation of the fluid by laparotomy, with or without irrigation of the peritoneum, is often followed by cure. Cases in which there are little free fluid and much

matting do not give nearly such good results. In these *x*-ray treatment is of some value. It need hardly be pointed out that operation should not be recommended when there is evidence of tuberculosis elsewhere, e.g., in the lungs; for in that case the abdominal affection is merely part of a general tuberculosis.

It should be added that the 'specific' treatment of abdominal tuberculosis by means of tuberculin or bacillary emulsion is advocated by some, and may be tried cautiously. (*See* SPECIFIC THERAPY.)

Robert Hutchison.

PERNICIOUS (ADDISONIAN) ANÆMIA.—(*See* ANÆMIA.)

PERSPIRATION, EXCESSIVE.—(*See* HYPERIDROSIS.)

PERSPIRATION, OFFENSIVE (Bromidrosis).—Patients who suffer from this troublesome complaint should pay great attention to personal cleanliness; a daily bath should be taken and the linen frequently changed. Thymol soap should be used freely. The feet, axillæ, and other parts where perspiration is most profuse, should be bathed with a 1 per cent solution of formalin, after which an antiseptic dusting-powder may be applied. Pieces of lint dusted with boric acid should be placed between the toes and changed daily; the interior of the socks may also be dusted with boric acid or tannoform. A lotion of 30 min. of ammonium ichthyolate to an ounce of cold water may be sprayed over the surface of the body with advantage in severe cases.

When the feet alone are affected, pure formalin or a 2 per cent solution of chromic acid may be applied on a tampon of cotton-wool. The application is at first repeated daily, but afterwards at longer intervals. It should be noted that the solution stains the skin and nails yellow. In milder cases glycerin should be applied to the soles and between the toes before the socks are put on. The application of the *x* rays is also very effective, and gives permanent results (*see* HYPERIDROSIS).

As regards internal remedies, laxatives are often helpful, but those which contain sulphur should be avoided. Liq. ferri perchlor. (Edin. Pharmacop.) 1 drachm, with calcium chloride 5 gr., in half a tumblerful of water three times daily, has also been recommended. (*See also* HYPERIDROSIS; BREATH, OFFENSIVE; and RADIOTHERAPEUTICS.)

Robert Hutchison.

PERTUSSIS.—(*See* WHOOPING-COUGH.)

PES CAVUS.—(*See* TALIPES, ACQUIRED.)

PHARYNGITIS.

1. **Acute Catarrhal or Simple Pharyngitis** is generally due to an acute cold in the head, but often occurs alone in those of a gouty or rheumatic diathesis, without any implication of the nasal passages. Care must also be taken to eliminate the possibility of secondary syphilis or Vincent's angina.

TREATMENT.—When it occurs along with a cold in the head, besides treating the cold (*see* RHINITIS), the pharynx should be sprayed with an alkaline solution and painted with collosol argentum or collosol iodine, or with Mandl's throat paint, two or three times a day.

℞	Potassii Iodidi	gr viij–xv	Olei Menthæ Piperitæ		℥ij
	Iodi	gr v–x	Glycerini	q.s. ad	℥j

2. **Septic Pharyngitis** is nearly always associated with acute disease of the tonsils or larynx, and is due to infection by a pyogenic organism.

TREATMENT.—The patient should be kept quiet in bed. The room may be warmed by means of a fire, but the windows must be open. Also oxygen may be given for five minutes every hour. As the infection is a mixed one, if the temperature runs high an injection may be given of polyvalent serum, or of antistreptococcic serum. Everything must be done to maintain the patient's strength, and if nourishment cannot be taken by the mouth, nutrient enemata must be given. A spray of cocaine (20 per cent) combined with adrenalin (1–2000) will often enable the patient to swallow, and will also prevent spasm of the larynx. The measures of alternately using hot and cold applications to

the throat, and a mustard plaster (*see* LARYNGITIS) should also be tried. If the dyspnœa becomes urgent, laryngotomy or tracheotomy must be performed. The most useful drugs are perchloride of iron (20 to 30 min.) with glycerin (30 min.), combined with liquor strychninæ (5 to 10 min.) and chlorate of potash (10 gr.).

There are two forms which occur independently of tonsillar disease, viz., tuberculous ulceration, and that which arises in the course of typhoid fever.

Abscess in the pharynx may also occur, and be (*a*) Septic; (*b*) Tuberculous.

a. Septic Abscess occurs under the name of retropharyngeal abscess in young children between the ages of two months and two years. The child gets restless for no apparent reason, and then difficulty of swallowing sets in. The diagnosis is made easy by the peculiar way in which the child holds its head back, with the chin protruded forwards and the mouth wide open, so as to make the passage into the lungs as short and straight as possible. The breathing is of a snorting character, thus differing from the stridor of laryngeal obstruction. On examining the throat for the cause of the stertor, the soft palate is seen to be red and pushed forward, and the posterior wall of the pharynx generally bulges more to one side than the other.

TREATMENT.—The abscess should be opened without delay. The child should be placed on a table with the head hanging over the end, but supported by a nurse or assistant. The mouth should then be kept open with a gag, and the abscess incised with a guarded bistoury. A spray of sanitas or Condy's fluid should afterwards be used until the wound is healed.

b. Tuberculous Abscess is due to caries of the cervical vertebræ. When dyspnœa occurs in a case of cervical caries, accompanied by difficulty of swallowing and retraction of the head, retropharyngeal abscess should always be looked for. In these cases the abscess should be opened externally from the neck behind the posterior border of the sternomastoid muscle, with aseptic precautions.

3. **Chronic Pharyngitis** may be divided into three chief groups: (*a*) General: (*b*) Granular; and (*c*) Pharyngitis sicca.

a. General Pharyngitis occurs in those who smoke or drink to excess, or use their voice much without knowing how to use it properly. It is also common in those of a gouty or rheumatic diathesis when they are exposed to damp or cold.

TREATMENT.—General treatment is necessary in all cases. If the nose be affected in any way it should be attended to, and smoking to excess or abuse of alcohol should be prohibited. In the cases due to gouty dyspepsia the diet should be regulated. If possible, the patient should take 'a cure' at Aix-les-Bains, Harrogate, Matlock Bath, Mont Dore, or a similar watering-place. If unable to do so, he can carry out the 'cure' at home by taking half a tumbler of Vichy water filled up with hot water before breakfast, instead of the morning cup of tea, and the same in the afternoon, substituting hot milk for the hot water, or by sipping two tumblers of hot water to one of which half a teaspoonful of Epsom salts has been added. If constipation be present, as it generally is, it must be treated.

The pharynx and nose should be sprayed with an alkaline wash, such as the following:

℞	Sodii Bicarbonatis	ʒiss	Olei Cajuputi	℥xx
	Sodii Chloridi	ʒiiss	Mentholis	gr. x
	Creasoti	ʒss		

Ft. pulv. A level teaspoonful to be dissolved in a tumbler of warm water, part to be sprayed or sniffed up the nose and part to be used as a gargle.

Carbolic acid lozenges (T.H.P.) may be used frequently. It is best to break one in half and take a half every hour.

In the case of clergymen and others who are exposed to damp and cold, and are constantly getting attacks, especially if they have to use their voice, it is an excellent plan to grow a full beard and moustache. This provides the throat with its natural protection, the all-round clerical collar should also be as open as possible, so as not to press upon the larynx, or the blood-vessels at the side of the neck.

b. Granular Pharyngitis, often called 'clergyman's sore throat', is characterized by little swellings of the lymphoid tissue surrounding the mouths of the mucous follicles dotted over the posterior wall. Sometimes the follicles are filled with mucopus, and have swollen veins running into them. It usually occurs in those who use their voice

professionally, and at the same time wrongly, and the various stages of the causation have been succinctly described as "constriction, friction, congestion, inflammation, and disease".

Treatment.—The first requisite is for the patient to learn to use his voice in a proper manner; otherwise, if the granulations be cauterized, others will appear as long as the cause continues. The writer has seen several throats which seemed to have had every bit of mucous membrane cauterized, with no good result, and as soon as the patient learned to breathe (*see* 'Breathing Exercises' under Adenoids), and to produce his voice properly, the granulations ceased to recur. Sometimes, however, only one or two granulations may be present, and give rise to a constant feeling of irritation and desire to cough. The application of the cautery to them generally removes all the symptoms for the time being. It is advisable, however, to paint the pharynx with Mandl's solution, or spray it with a solution of aceto-tartrate of alumina (1–500) or argyrol (30 gr. to the oz.), for some time afterwards.

c. Pharyngitis Sicca.—This condition is always dependent on disease of the nose or nasopharynx, and disappears if the latter can be put right. Stuart-Low recommends spraying the nose and pharynx, after cleansing them, with a solution of mucin. It certainly keeps the throat moist for some hours after using it. *George C. Cathcart.*

PHARYNX, FOREIGN BODIES IN.—(*See* Foreign Bodies in the Air-passages and Œsophagus.)

PHARYNX, MALIGNANT DISEASE OF.—(*See* Mouth and Pharynx, Malignant Disease of.)

PHIMOSIS.—By phimosis is meant a condition in which the preputial orifice is too small, so that the prepuce cannot be fully retracted and the glans exposed. It may be congenital or acquired. When congenital it is associated with adhesions between the prepuce and the glans. When acquired, it is either *temporary*, in which case it is the result of inflammatory swelling of the prepuce, and may disappear when the inflammation subsides, or *permanent*, when it is the result of repeated attacks of balanitis, or of chronic inflammation associated with diabetes (Thomson Walker), or is due to the contraction of chancroids occurring at the preputial orifice. Both in children and adults a slight degree of congenital phimosis may be aggravated by the presence of septic sores and inflammatory induration about the preputial orifice.

In infants and children phimosis is usually treated by circumcision, though this is not always necessary in the mildest cases. When the prepuce is of normal length and its orifice only slightly contracted, it should be forcibly retracted and the adhesions broken through. This manœuvre should be repeated daily by the nurse, a little simple ointment being smeared over the glans.

The following are the indications for circumcision in children with phimosis: (1) Moderate or severe contraction of the orifice; (2) A long prepuce, whether the contracton of the orifice is considerable or not; (3) When the daily retraction of the foreskin is not being successfully carried out; (4) When the condition has given rise to masturbation, or other signs of irritation.

In adults, every case of phimosis, whether congenital or acquired, with the possible exception of some cases of the temporary inflammatory variety, should be submitted to operation. In acquired phimosis associated with diabetes, only the most severe cases should be operated upon, and then only with elaborate precautions against sepsis, and under local anæsthesia (Walker). It is unnecessary to enumerate here the various troubles of an inflammatory and even of a malignant nature which are aggravated or even indirectly caused by phimosis in the adult, and which may call for the immediate relief of the deformity.

Two operations are available, viz., slitting up of the prepuce on the dorsum, and circumcision. In the presence of acute inflammation, particularly when the prepuce itself is much involved, the former operation is to be preferred, and should be performed without delay. The prepuce should be slit up as far as the corona, and the corners of the two flaps thus formed trimmed off. A director should be used to ensure separation of

the prepuce from the dorsum of the glans before the former is slit up. In all other cases circumcision should be performed.

The Operation of Circumcision.—A general anæsthetic should be administered to all children, and most adults, though in the latter novocain or eucaine may be used in some cases. The parts having been cleaned up in the usual way, the penis is passed through a hole cut in the centre of a piece of sterilized lint. The extremity of the prepuce is seized in a pair of toothed catch-forceps and gently drawn forwards. The prepuce is then grasped by a pair of long-bladed dressing-forceps placed obliquely, from above downwards and forwards, opposite the anterior part of the glans, which is allowed to slip back as the forceps are closed. The prepuce is then cut away in front of the forceps with a knife or scissors. The late Mr. Davies Colley directed that " the incision should begin upon the dorsum, at a point corresponding to that part of the glans which is half-way between the meatus and corona", and should leave "a sharp point in the middle of the under surface" to cover the raw area which would otherwise be left uncovered opposite the frænum (*Fig.* 55). The mucous membrane is now slit up on the dorsum nearly to the corona with a pair of scissors, a director being first used if any difficulty is experienced in breaking down adhesions. The two flaps of mucosa are then peeled off the glans till the whole of the corona is exposed, and all smegma cleaned away. The redundant mucosa is now cut away with scissors, leaving an eighth of an inch, or a trifle more, all round, or just enough to carry the sutures and to cover the sensitive coronal papillæ.



Fig 55.—Circumcision.

Kirmisson suggests the application of artery clips to the prepuce to mark the line at which the section is to be made.

The frænum itself must not be damaged. To prevent the œdema which so often occurs in the region of the frænum, a narrow strip of the loose areolar tissue lying between the mucosa and the skin should be pulled out and excised from the ventral side of the glans. It is important that all vessels which are bleeding, or are likely to bleed when reaction sets in as the child recovers from the anæsthetic, should be secured. This can usually be done by means of the sutures, but if any vessels continue to bleed they must be ligatured. A few interrupted sutures of catgut are inserted in all cases, even in infants. For the latter, three are quite sufficient, one being placed at the frænum and one on either side.

In young children the dressing should be a piece of gauze, soaked in lead lotion, and wound round the penis. This can be soaked off in a bath, and renewed by the nurse once a day till healing has taken place. In adults the same dressing may be used, or the penis may be simply wrapped in plain dry gauze; in either case the dressing need not be disturbed till the fourth day, when it is soaked off, some of the stitches are removed if not of catgut, and a fresh, dry dressing is put on. In adults the penis should be slung up to the abdominal wall with a handkerchief or triangular bandage, to prevent œdema. The patient should remain in bed for a couple of days, and should be on his feet as little as possible till the end of a week, when all the stitches should be out and the wound healed. Jacobson recommends a dose of bromide at night to prevent erection of the organ.

It is important that the operator should remember (1) To remove plenty of mucous membrane: if this is not done relapse may follow, as the deformity is caused by contraction of the mucosa, not of the skin; (2) Not to remove too much skin: he must leave enough to cover the corona; (3) Not to damage glans or frænum, though he should remove as much tissue as possible near the latter.

There is one more important point which should always be remembered while circumcising a child. The meatus should always be examined, as it is often too small, and is more often the cause of difficulty in micturition than is phimosis. Moreover, after circumcision, the glans becomes dry by exposure, and exhibits a tendency to the formation of scabs about the meatus, as well as further back where adhesions have been torn, so that the orifice is still further contracted. If the meatus is small it must be

enlarged downwards, and a horsehair or fine gut suture inserted at the bottom of the cleft thus made, and left in for ten days or a fortnight, when healing will have occurred. The edges of the enlarged meatus should be separated daily, and a little ointment applied.

H. A. T. Fairbank.

PHLEBITIS.—Treatment depends upon the cause and extent of the phlebitis. An inflammation due to causes not actively septic, and localized in a small vein, runs a favourable course if the part be protected from injury and movement. The single risk is that of embolism through the detachment of clot from the inflamed and thrombosed vein, and this is to be minimized by securing that the clot shall be left undisturbed till it has either been absorbed or has formed strong attachments to the vessel wall. This takes ten days.

The most common example occurs in connection with varicose veins of the legs, and in such cases elevation of the limb, rest in the horizontal position in splints for two weeks after the active mischief has ceased, and hot applications, are suitable treatment.

Where deeper veins are involved—for instance, the common femoral—the cause is more serious, and the extent of the clotting less likely to be limited. Preventive treatment therefore occupies a position of first importance. In all cases likely to develop this complication—and it is specially common in patients who have lost much blood and have undergone some pelvic traumatism such as fractured pelvis, difficult parturition, or operation for pelvic disease, and still more so if septic infection has been superadded—the lower limbs should be rubbed upwards three or four times daily in order to assist the venous circulation, and this should be commenced not later than a week after confinement to bed. At the same time daily exercise of the legs should be practised, the movements being similar to those used to propel a bicycle. These simple measures, which I have now advocated and employed for some years, rarely fail to prevent phlegmasia alba dolens, the classical name for phlebitis and thrombosis of the femoral vein.

The treatment of the developed condition is, to say the least, unsatisfactory. The pain may be relieved by elevation of the limb, complete rest of body and limb, and the use of hot fomentations containing opium or belladonna. Careful nursing and fever diet are necessary during the first two weeks. If all tenderness has then disappeared, and there are no signs of further extension of the inflammation and clotting, gentle massage may be commenced, with the object of reducing swelling and assisting the anastomotic circulation in the limb. At a later stage more vigorous massage is employed, and when the patient gets up, as he may be allowed to do in favourable cases after the sixth week, an elastic bandage aids in the reduction of that swelling of the limb which constitutes the most troublesome and rebellious of the inflammatory results.

In the most acutely septic cases, recognized always by their recurring rigors, the only treatment likely to be successful is arrest of the circulation through the infected vein by means of operation.

The most successful application of this method of treatment has been in septic phlebitis and thrombosis of the lateral sinus secondary to suppuration in the middle ear. In such cases operation has been the means of saving many lives.

A more recent application of operative methods for arrest of the circulation in infected veins deserves more recognition than it has yet received.

As a consequence of uterine sepsis, generally puerperal, thrombophlebitis of the pelvic veins may occur. Recurring rigors in a predisposed woman are strong evidence, however good the general condition of the patient between the rigors may be, that this is the cause of her illness, that surgical measures alone are likely to be useful, and that operation to obliterate or excise the infected veins should be considered without delay.

A similar condition occurs in connection with rare cases of acute appendicitis. Thrombophlebitis of the appendicular veins follows the attack or the operation, and may steadily progress to infection of the liver through the portal circulation. The first evidence is a rigor; this is followed by repeated, usually daily, rigors, and the patient, though often at first in good condition, rarely escapes death. Excision of the ileocolic vessels and the bowel which they supply (six inches of ileum, cæcum, and ascending colon), followed by anastomosis between the ileum and transverse colon, is now so safe an operation, and offers in an early stage so good a chance of arresting the venous infection,

that on the first available opportunity I intend to have the courage of my convictions and perform it.

Phlebitis of the facial veins occurs frequently from infections of the face, and thrombosis of the cerebral sinuses may follow spread of the sepsis. All superficial septic foci on the face should be isolated by a circular incision, and if this demonstrates thrombosis, the infected veins should be opened, the thrombus followed up and removed, and the resulting wound should be packed open with sterile or iodoform gauze.

Rutherford Morison.

PHLEBOTOMUS FEVER.—The treatment for this short fever is entirely symptomatic. The debility which sometimes follows requires change to a cooler and more bracing climate. *C. W. Daniels.*

PHOBIAS.—(*See* NEURASTHENIA and PSYCHONEUROSES.)

PHOSPHATURIA.—An unnatural deposition of phosphates in the urine is seen under a variety of conditions, the most common being one where, owing to an alteration in the inter-relationship of its normal saline constituents, and a consequent diminution in the acidity of the urine, phosphate of lime in an amorphous form is present in the urine as passed, giving it a milky appearance. This condition is seen frequently in health, to a slight degree, in the urine passed immediately after meals, but it occurs not uncommonly to a greater extent in young men in association with gastric disturbance. Such patients pass a more or less milky urine throughout the day, although that passed the first thing in the morning may be free from deposit. They generally suffer from some form of indigestion, are not uncommonly thin, and their general nutrition is bad ; they frequently present marked neurotic or neurasthenic symptoms. The milky appearance of the urine not uncommonly gives rise to alarm, owing to its abnormal appearance. There is no evidence that in such cases there is any unnatural amount of phosphates excreted, the whole condition being merely dependent on the alteration of the relative amounts of soluble and insoluble phosphates in the urine. The condition can usually be treated by simple measures directed to increase the acidity of the urine, and this can be effected by alterations in the diet, e.g., the diminution of vegetables, and by the prescribing of acids and the treatment of the indigestion, and by encouraging the ingestion of considerable quantities of fluid.

Where the deposition of phosphates is associated with decomposition of the urine and the development of ammoniacal fermentation, the conditions are totally different. In such instances treatment must be directed to checking fermentation, either by local treatment of the cystitis, or by the administration of urinary antiseptics such as hexamine, and by measures directed to increase the acidity of the urine. This can often be brought about by giving acid phosphate of soda, and in this way the urinary fermentation can be greatly checked. In many cases of bladder and prostatic disease, where cystitis with ammoniacal fermentation is present, the administration of acid phosphate of soda is advisable for some time prior to operative procedures being undertaken, since by this means the local conditions can be rendered much more favourable to the success of such treatment. The acid phosphate of soda should be given in full doses.

In addition to these more or less common forms of so-called phosphaturia, there is another condition of genuine phosphaturia, in which the actual amount of phosphates excreted is increased. It is a condition which has sometimes been spoken of as phosphatic diabetes, and which has been described by some as not only existing in diabetes, but as also occurring prior to the onset of glycosuria. In phosphatic diabetes unaccompanied by glycosuria, the nutrition would seem to be considerably affected, and much wasting may be present ; the only treatment available is that directed to improving the general nutrition. In true diabetes, the excess of phosphates in the urine is probably largely dependent on the increased appetite. (*See also* CALCULUS.) *John Rose Bradford.*

PHOTOTHERAPY.—The use of x rays as a therapeutic measure is dealt with in another section, and under the heading phototherapy we have to consider only two types of *Light Treatment*, those by the arc lamp and by the incandescent—with a brief reference to the Finsen rays.

The Electrical Arc Lamp is one of the earliest forms employed. When iron-cored electrodes are used for its generation, it has the advantage of giving out rays very rich in the chemical factor belonging to the ultra-violet end of the spectrum. A practical disadvantage of this light is that it has to be always in the horizontal or semi-horizontal position, and not suspended over the patient, owing to the danger of burning particles of carbon falling on him from the electrodes as they consume. Also, a very heavy current is used up in proportion to the amount of radiant light and heat given off, much heavier than when a high-power incandescent lamp is used, such as the leucodescent. The arc lamp, moreover, is unsuitable for use in an enclosed chamber such as the electric-light bath, because of the gases, composed largely of ozone and nitrous fumes, thrown off. Ultra-violet rays, moreover, produce a very high degree of hyperæmia of the skin, with resultant tanning, if used for any length of time. While the hyperæmia is to be desired in many cases, the tanning interferes with any subsequent application of a radiant energy to the deeper tissues.

Duration.—Fifteen to twenty minutes, according to nature of case and the toleration of the skin of patient.

Of **Incandescent Lamps,** the special form known as the *leucodescent* is the most efficacious and powerful. It consists of a high-power incandescent electric lamp—from 300 to 500 C.P.—placed within a cylindro-conical metal hood. This hood is lined with a highly polished nickel-plated surface, known as the reflector. The back or top of the dome-like hood is formed by a corrugated aluminium plate called the condenser. It is made of aluminium, owing to that metal's freedom from tarnishing. It is important to keep the nickel-plated reflector bright by means of silver polish and a small piece of chamois leather. The lamp differs in construction from the ordinary types employed for domestic purposes in some details. It is held within the hood by means of two binding posts connected by suitable wiring with the street current, which is conveyed to the filament in the bulb. The operator must therefore not attempt to take the lamp out by means of the usual twist to one side or another when a bayonet catch is used. To remove the lamp, first see that the switch reads 'off', and then take out the screws at the top of the porcelain cap, carefully supporting the lamp with one hand inside the hood. Detach the cable ends from the porcelain disc inside the cap, and remove the lamp from the reflector. Then, detaching the lamp connections from the under side of the disc, pull the lamp out of the holder.

One of the great advantages of the leucodescent lamp is its ready adaptability to any room or surgery where the electric current is available. The whole apparatus swings from a wall bracket, and is balanced on it by a weight equipoise and two easily running pulleys. The cord on which it is suspended only requires to be connected up with a wall plug, and then the lamp can be moved up or down, or from side to side, with the greatest possible ease and with a large range of movement. In this respect it compares very favourably with the arc lamp, which has to be supported on a stool covered with asbestos sheeting, and which is capable of very little movement.

Attached to one side of the hood of the leucodescent is a wooden handle for manipulating it, and on the opposite side is a window of inspection for observing the effect on the part being treated. According to whether the affection is *acute* or *chronic* there are two modes of applying the treatment by this apparatus :—

1. The light may be gradually focused so that the application can be tolerated for a considerable time at each application. The lamp is kept at a good distance from the part under treatment, and the heating effect is controlled by the operator brushing his hand from time to time over the part. A good plan is to keep the lamp swinging slowly to and from the part being treated.

Duration.—Twelve to fifteen minutes each part.

2. In acute affections it is better to apply the rays strongly for a brief period.

Affections for which the Leucodescent Lamp is suited :—

In *localized inflammatory conditions due to pyogenic organisms*, such as boils, abscesses, and acne pustules on the back, etc. A prolonged application destroys or lessens the vitality of the organisms and relieves the pain in a very remarkable manner. Subsequently a small incision may be made and the pus evacuated. The pain of the incision

is lessened by the exposure to the rays. If the suppuration be deep, an application of half an hour or more may be necessary.

Muscular rheumatism, lumbago, etc.—Prompt relief is afforded in this class of affection by a few applications. *Pleurodynia*, or intercostal neuralgia, is similarly benefited. The patient is laid on the sound side, and brief, strong applications of half to one minute are made; then the lamp is moved farther away for a pause, and the application repeated in a little while until some relief is afforded.

Neuritis.—This affection of course depends on a vast variety of causes, from injury to various toxæmiæ, such as gout, rheumatism, malaria, alcohol, lead, arsenic, syphilis, diphtheria, etc. Very often, therefore, a prolonged course of constitutional, as well as local, treatment is needed; but in any case the severe pain, which is so common a symptom, is markedly relieved by an application of the lamp. Similarly, in *neuralgia* it may be used with benefit, and the depressing and deleterious effects of coal-tar product tablets avoided. Such treatment is to be preferred in every way, for the patient does not go off and purchase a bottle of tablets and *feed* on them for weeks while the pain troubles him, but returns to his doctor for an application when the pain is severe, and the latter is thus enabled to keep in touch with him and shorten the cure.

One of the most common affections calling for this treatment is *sciatica*. The application must be made along the outer aspect of the hip and thigh, and close over the great trochanter, for a few minutes at a time. In this way the congestion of the nerve is lessened and relief afforded, though perseverance may be needed in this as in all forms of treatment for so obstinate an affection.

In most of the above affections the effect of the lamp is greatly enhanced by applying the static wave to the part immediately after, with a lead foil electrode.

The Dowsing Incandescent Lamp is a small portable lamp for the local application of radiant heat, placed on the market by the Dowsing Co. It is much less powerful than the leucodescent as a therapeutic agent, but is very useful for treating restricted areas, such as a shoulder-joint or an elbow, and is very easy to manipulate.

The Finsen Rays.—The Finsen light was first applied by the well-known Danish inventor of this name, for the treatment of lupus. The principle was to focus sunlight through water lenses pressed over the skin so as to render it anæmic and permit the rays to penetrate. Partly because sunlight is less rich in ultra-violet rays than the electric arc lamp, and partly because of its inconstant supply, large electric lamps of the arc type were devised by Finsen for the treatment, the light being focused by means of telescopes, fitted with quartz lenses cooled by water. Quartz allows almost free passage to ultra-violet rays, much more so than glass. The lamps are very powerful, and require a heavy current of about 80 ampères. Smaller and more portable types of lamps of the Finsen description have been made. viz., the Finsen-Reyn and the Lortet-Genoud (full particulars from the Cavendish Electrical Co., Great Portland Street, W.). They are brought close to the patient and are available for only one person at a time. With the large Finsen fitted with several telescopes, as many as four patients can be treated at once. The Finsen-Reyn lamp requires about 20 ampères of current, and is the best modification.

The Finsen light in no way rivals *x* rays for any other affection than lupus. For this affection it has at least the advantage of complete safety. It is, however, very slow in its cure, and taxes both the patient's and the physician's time and patience. Also it is difficult to penetrate the deeper tissues by means of its use.

A very complete and elaborate Finsen outfit was installed at the London Hospital some years back, and many cures have been effected by it. For rodent ulcer and malignant disease generally, Röntgen treatment is much more efficacious and to be preferred.

T. D. Luke.

PHTHISIS.—(*See* Pulmonary Tuberculosis.)

PHTHISIS, LARYNGEAL.—(*See* Larynx, Tuberculosis of.)

PILES.—(*See* Hæmorrhoids.)

PITYRIASIS ROSEA.—This disease usually disappears spontaneously in from six to eight weeks, but its departure can be greatly hastened by treatment. Every night the patient should take a bath to which sufficient permanganate of potash is added to make the water claret-coloured. After drying, a 5 per cent salicylic ointment should be well rubbed in. In favourable cases the eruption is removed in less than a week; in others it may persist for a fortnight. *Norman Walker.*

PITYRIASIS VERSICOLOR.—The treatment of this disease is really only difficult beause the fungus is so easily destroyed that the patient is usually satisfied with a large measure of apparent improvement, and leaves off treatment prematurely. If even the smallest portion of fungus be left, it is quite obvious that the disease will 'return'. It is therefore necessary to keep up the treatment for a considerable time after all traceable evidence has disappeared. Almost any antiseptic will destroy the fungus, but it is better to use those which at the same time produce an exfoliation of the cuticle, such as tar, resorcin, and salicylic acid. While not denying altogether to hyposulphite of soda some antiseptic powers, the writer is of opinion that it owes its reputation in this disease largely to its bleaching properties. *Norman Walker.*

PLAGUE.—*Symptomatic treatment* is that usually adopted. As early as possible in the disease, calomel (3 to 5 gr.) should be given, and be followed by a saline purgative. Diarrhœa, if it occur, is best treated by antiseptics such as salol; or bromide and morphia may be given. Stimulants must be used early, on any sign of cardiac failure. If collapse occur, strychnine hypodermically gives the best results. In apparent convalescence, the possibility of sudden cardiac failure must be remembered.

Hypodermic injections of morphia may be required to produce sleep and relieve pain. The buboes may be fomented or treated with glycerin and belladonna. When pus forms, they should be incised, but there is no advantage in incisions in the early stages. All dressings and discharges may be carriers of infection, and must be thoroughly sterilized or destroyed.

Serum Therapy.—Numerous attempts at treatment by the injection of sera have been made, but none can be said to be of proved value. Yersin's and Lustig's sera in large doses are still advocated by some observers. Injections of various antiseptic solutions into the buboes have not led to any beneficial result.

In the pneumonic form, stimulating expectorants, inhalations of oxygen, and antiseptic sprays have been used, but are of doubtful value. (*See also* Specific Therapy.)

C. W. Daniels.

PLANTAR ABSCESS.—(*See* Abscess.)

PLEURISY.—(*See also* Rheumatism, Acute.) Putting aside questions of etiology, and looking at this affection mainly from the point of view of treatment, pleurisies become naturally divided into acute and chronic, dry or with effusion. The acute stage is much the same for the cases which remain dry and for those in which fluid eventually forms. We will, therefore, consider the treatment of: (1) *Acute Pleurisy;* (2) *Chronic Dry Pleurisy;* (3) *Pleurisy with Effusion.*

1. **Acute Pleurisy.**—Here we have no effusion, and our indications are to relieve pain, reduce fever, and prevent, as far as possible, extension and implication of lung. At the same time we must carefully watch for indications which would point to the presence of trouble in the lung, pericardium, or any other organ of which the pleura is only a part, and also for the supervention of effusion, with which we may subsequently have to deal.

The patients hould be kept warm and at rest in bed. Leeching, wet or dry cupping, blistering, or repeated hot stupes or poultices are the best local measures. The first two (leeches and cupping) are the most efficacious for the relief of pain and checking extension, and should be used in all severely acute cases. Bleeding may be encouraged by subsequent poulticing. The patient is easier the more the respiratory movements can be restrained; firm bandaging or strapping of the chest often helps in this way, and, for a similar reason, it is well to check a troublesome cough with some simple linctus. There is generally some fever, and it is well to open the bowels with a pill or calomel and saline,

followed by a diaphoretic mixture. If the attack occurs as part of acute or subacute rheumatism, salicin, salicylate of soda, acetylsalicylic acid, or some other antirheumatic treatment, is often rapidly effectual in giving relief. The presence of Bright's disease must not be overlooked, as influencing the use of opium and blisters, and as also affecting the gravity with which we regard the case. Further, it is obvious that the treatment must be influenced to a certain extent by whether the attack is simple, or only part of some grave malady in the course of which it occurs.

2. **Chronic Dry Pleurisy.**—This is generally rheumatic, frequently recurrent, and the danger of its prolongation is great thickening of the pleura, with possible fibrotic extension into the lung itself, which may eventually culminate in a more or less contracted fibroid condition (cirrhosis). It may arise as an acute pleurisy, when the treatment already discussed for that condition will be necessary; but more generally it runs a chronic course, with slight subacute exacerbations. The chief indication is to keep the patient at rest, limiting especially the respiratory movements of the affected side, for by these movements recovery is delayed, involving increased thickness of pleura and more permanent damage to the lung. The patients are frequently not at all ill, and it is, therefore, difficult to persuade them of this necessity, but it is a point which must be emphasized. They should be kept at rest, the chest bandaged or strapped, and, until the attack has passed off, any exertion or further exposure, which may cause a relapse, must be forbidden. The salicylates are not so effective in this form, but iodide of potash and belladonna are often useful. After or between attacks it is important to see to the proper expansion of the lung by appropriate gymnastics and deep-breathing exercises.

3. **Pleurisy with Effusion.**—Pleural effusions have been divided pathologically into: (1) Septic; (2) Idiopathic; and (3) Mechanical. For purposes of treatment they are perhaps better divided into: (1) The small or stationary; (2) The large or increasing. (Only serous effusions will be dealt with here; for purulent effusions, *see* Empyema.)

Small or large effusions may arise acutely, and the appropriate treatment for acute pleurisy may have been employed. Many, however, arise without any acute stage, often the only complaint being increasing dyspnœa. Beyond the treatment already discussed for pleurisy, all we have to consider is the question of tapping. Many authorities advise early and repeated tappings, whatever the cause of the pleurisy or the amount of the fluid. We believe, however, that many small effusions accompanying febrile disorders or following simple lung affections (such as bronchitis and pneumonia) become rapidly reabsorbed, without causing any inconvenience or leaving any more mischief behind than if they had been tapped. Let us consider the possible results of leaving fluid untapped, or of taking it away, and then try to deduce guiding rules in this matter.

Dangers Attending Thoracentesis.

i. Syncope, from too rapid emptying, and consequent sudden shifting of important organs (heart, etc.).

ii. Rupture of lung, which may be softened by inflammatory changes or partly tied down, so that only part of it can dilate.

iii. Conversion of a serous into a purulent effusion.

iv. Repugnance of patient and friends to the operation, which may have to be frequently repeated.

v. 'Albuminous Expectoration' (rare), from the sudden release of previously compressed vessels, allowing copious exudation into tubes and alveoli.

Dangers Attending an Untapped Pleural Effusion.

i. Permanent damage to lung, which, if long collapsed, will undergo fibroid changes; also thickening of pleura, which prevents complete expansion subsequently.

ii. Sudden attacks of syncope, which are frequently fatal. (These occur chiefly with large effusions. N.B.—It is very difficult to tell whether an effusion is large or small.)

iii. Protraction of the case to the detriment of the general health.

We would suggest the following rules for guidance:—

a. When an effusion is obviously small in amount; is causing no inconvenience to circulation or respiration; when it has followed some definite simple affection of the lung, such as bronchitis or pneumonia; then, perhaps, especially in children (who so frequently rapidly reabsorb pleural fluid), there is no harm in allowing a week or two to pass, to give time for reabsorption.

b. When, in the course of pneumonia, an effusion forms on the affected side, unless our hands are forced by urgent symptoms, we should give the lung time to resolve before tapping, and in any case only a small amount of fluid should be withdrawn. We have seen pneumothorax result from neglect of this precaution, where the lung, softened by the pneumonia, ruptured in trying to dilate as the fluid was withdrawn.

c. On the other hand, when the effusion is large, or increasing; when it is of long standing or recurrent; whenever it is attended by urgent symptoms; when it has come on insidiously (that is, from some cause not likely to be shortly removed); and when, as in the above-mentioned exceptions, time has been given and no progress made, then undoubtedly the best and quickest results are given by tapping, and, if necessary, doing so repeatedly.

Thoracentesis.—The operation, small as it may seem to the surgeon, is not considered so by the patient or his friends, and it is well to remember that it can be ill or well done. The chief points to be remembered are these :—

i. The patient should be in the lying or half-lying position.

ii. The operation must be carried out with the strictest antiseptic precautions; the diagnosis having been verified by hypodermic needle.

iii. The trocar and cannula used should be of medium size; if too large, there is danger of withdrawing the fluid too rapidly; if too small, it is very apt to become choked by lymph. Further, the larger the instrument, the greater the force needed to puncture and the greater the pain inflicted. Whether the ordinary aspirator (Potain) or the large exhausting syringe (Dieulafoy) be used, or the fluid allowed to trickle out under its own pressure, care should be taken that the withdrawal is *slow*. If coming too fast, it can be checked easily by pinching the rubber tube.

iv. The point at which the puncture should be made must vary according as the fluid is free, or located in some particular part of the pleural cavity. When the fluid is in the general cavity, a point should be chosen a little in front of, or behind, the posterior axillary border, at the level of the angle of the scapula.

v. In introducing the needle, care must be taken to keep close to the upper border of a rib (lower border of the space), to avoid injuring intercostal vessels.

vi. A general anæsthetic is strongly contra-indicated; a local one may, occasionally, be needed. For this purpose a few minims of 5 per cent solution of eucaine may be used.

vii. Have brandy and ether handy in case of necessity.

viii. It is not well to take away all the fluid that will come; 20 to 50 oz. is generally quite sufficient at one time. Frequently the remaining fluid will be rapidly absorbed when only a small quantity has been removed.

ix. The necessary amount having been withdrawn, remove the instrument, and seal the puncture with a piece of lint soaked in collodion.

The dangers of tapping: (*a*) If sudden faintness come on, withdraw the instrument, or check the flow of fluid by pressure on the tube, and apply restoratives. (*b*) If troublesome cough occur, the withdrawal of fluid should be discontinued. (*c*) If 'albuminous expectoration' result, it is stated to be increased by the attendant cough, and this should be checked by morphia. *Too rapid removal* may cause both (*a*), (*b*), and (*c*). (*d*) If a serous effusion should become *purulent*, treat the case as an empyema (free drainage) without delay.

After the removal of fluid, our object is to get the lung to expand. We should, therefore, not bandage or strap the chest, as is sometimes recommended, but, on the other hand, after a day, get the patient to use Wolff's bottles (blowing water from one to the other), so as to help in expanding collapsed air vesicles. It is well not to delay this, and in our experience reaccumulation is less frequent in cases where this method is employed early.

Injections of Adrenalin.—These have been employed with the idea of contracting the vessels of the pleura and so preventing recurrence of the effusion. We have seen very good results, in cases where the fluid has recurred frequently, from injecting 10 to 15 min. of 1–1000 adrenalin chloride solution into the pleural cavity after part of the fluid has been withdrawn.

The after-treatment of cases of pleural effusion is perhaps more important than their immediate management. If the effusion occur in the course of morbus cordis or Bright's

disease, the proper treatment of these conditions must be undertaken. If the effusion be primary, the origin is nearly always tubercle. Attempts should be made to arrive at a definite diagnosis in such cases by carefully examining the lungs for any evidence of phthisis, and by submitting some of the fluid to expert examination for tubercle bacilli. When this cannot be done, we should not be far from the mark if we regard all cases of primary idiopathic, serofibrinous, pleural effusion as tuberculous. It is only necessary to point out that, for all such, the proper treatment is that which is now well known as 'sanatorium' or 'open-air' treatment. Cases of phthisis, starting with pleural effusion, are, as a rule, very hopeful ones, and no pains should be spared to persuade them to undergo a course of after-treatment as suggested above. *W. J. Hadley.*

PLEURODYNIA.—(*See* RHEUMATISM.)

PLUMBISM.

1. CURATIVE TREATMENT.—This may be summed up in the employment of means to relieve symptoms, promote elimination of the metal, and to restore function.

In the milder forms, with recurring attacks of colic and constipation, it is desirable that the bowels should be moved as early as possible by means of olive oil and warm water enemata, and by the internal administration of magnesium sulphate along with belladonna and carminatives :—

℞	Magnesii Sulphatis	℥vj	Tincturæ Zingiberis	℥iv
	Tincturæ Belladonnæ	℥iiss	Aquæ Destillatæ	q.s. ad ℥viij
	Tincturæ Cardamomi Co.	℥iv		

A tablespoonful in water every three hours until the bowels have been moved.

There is the opinion that sulphate of magnesia acts in these cases by precipitating lead in the bowel in the form of a rather insoluble sulphate. There is no proof that lead sulphate is less soluble in the alimentary canal than the carbonate. Opinions are divided upon this point ; besides, *all* lead compounds are more or less poisonous. Workers in lead sulphate show signs of a well-marked saturnine cachexia, but in them the symptoms are developed slowly.

When colic is extremely severe, and the patient is being worn out from want of food and sleep, a hypodermic injection of morphia may be required. Should there be vomiting, an effervescing mixture of soda and bismuth may be tried, e.g. :—

℞	Sodii Bicarbonatis	℥ij	Tincturæ Zingiberis	℥ij
	Liq. Bismuthi et Ammon. Citratis	℥iv	Spiritus Chloroformi	♏xl
	Spiritus Ammoniæ Aromatici	℥ij	Aquæ Destillatæ	q.s. ad ℥viij
℞	Acidi Tartarici	℥iss	Aquæ Destillatæ	℥iv

One tablespoonful of No. 2 to be added to two tablespoonfuls of No. 1, and drunk during effervescence, four times a day.

Warmth applied to the abdomen, and, in severe cases, a hot bath, will often give relief. If the colic persists after the bowels have been opened, nothing acts so well as sulphite of soda, in doses of ¼ or ½ gr. every three hours :—

℞	Sodii Sulphitis	gr. ¼	Aquæ	q.s. ad ℥j
	Tincturæ Cardamomi Co.	♏xv		

Every three hours.

Calcium permanganate, ¼ gr. in paraffin capsule thrice daily, often gives rapid relief to lead colic. It is well worthy of a trial. Potassium iodide favours the elimination of lead from the system, but, if given too early or in too large doses, a patient may thereby be re-poisoned by lead which has been dissolved out of his own tissues. This drug should therefore be avoided in the severe and acute forms of plumbism ; but in the milder cases of colic and constipation, after the bowels have been freely moved by sulphate of magnesia, a few grains of potassium iodide may be safely added to the aperient. Iodide of potassium has in a few instances caused albuminuria, which ceased on discontinuing the drug.

In **Lead Palsy** the object of treatment is to eliminate lead from the system and restore function. Iodide of potassium will accomplish the former ; but to restore function

ıypodermic injections of strychnine may be resorted to, with massage and electricity. Opinions differ as to whether the hands, when affected by wrist-drop, should be allowed :o hang by the sides, or be supported on splints. The latter plan has much to commend 't, in that it takes the weight off the affected muscles, and reduces the synergic action of those which are still healthy.

In the use of electricity in these cases, it must be remembered that the therapeutic effect is *not* to be measured by the amount of contraction produced in the muscles ; there are invisible nutritive and vasomotor effects which are of great service. Indeed, over-stimulation of the muscles may induce fatigue, and do harm. Induction-coil or sinusoidal currents may be used, with or without a water bath, to produce functional stimulation of the paralyzed muscles. Electric baths aid in the elimination of lead, and are therefore to be recommended. (*See also* NEURITIS, and ELECTROTHERAPEUTICS.)

2. PROPHYLACTIC TREATMENT.—For lead workers, personal cleanliness is of the first importance. The hands should always be washed before eating ; baths should be provided at all workshops where lead or its compounds are manipulated, and the workpeople urged to take a warm bath at least once a week. Aperients should be taken regularly. The acid lemonade on draught in lead works has only a questionable value ; sulphur lozenges, taken twice a week, do more good. In some of the white-lead factories these have been superseded by a chocolate lozenge containing 5 gr. of hyposulphite of soda. Frequently workmen take two or three of these per day. While the lozenges are followed in some of the men by a mild aperient result, upon all the workmen they exercise a distinctly preventive influence. The day's work should not be begun without a meal ; milk is of special value as a preventive. Finally, it should be remembered that, once a patient has had lead colic, he becomes more susceptible to the metal, and ought therefore to exercise greater care at the factory, and change his occupation if the attacks are recurrent. In obscure cases of plumbism the drinking water should be analyzed for lead : 1 mgrm. of of lead per litre of water is dangerous.

Electrolysis.—By means of the double electrical bath, encouraging results have been obtained in the treatment of workpeople employed in lead factories. In response to my suggestion that lead might be removable from the body of a lead-poisoned person, Mr. T. Maltby Clague, of Newcastle-on-Tyne, devised a double electrical bath. It is a simple procedure. The whole body is not immersed. The workman, seated on a stool in a room in the factory set aside for the purpose, places his feet in a bath of warm water, while his arms are immersed in another bath. The positive pole of a battery is dropped into the foot-bath and the negative is placed in the arm-bath. A current of low voltage, usually 16 volts, with a milliampèrage gradually raised to 30 and 40, is allowed to pass for half an hour, or a little longer. To diminish the resistance a little salt is added to the foot-bath. No pain is experienced. The bath is taken every day or every second day. On the negative electrode lead is frequently found, the blue line on the gums rapidly disappears, as also the anæmia, and a feeling of fitness and well-being is experienced by the patient. Since the warm bath once a week is one of the requirements of lead workers by the Home Office, the double electrical bath not only supersedes this, but is preventive and curative as well.

Thomas Oliver.

PNEUMONIA.—(*See also* BRONCHOPNEUMONIA.) There is no disease which has given rise to so much difference of opinion as regards treatment, nor for which so many so-called specific remedies have been vaunted, as this. One might divide the various schools of treatment thus :—

1. Those who leave everything to nature, believing all interference useless or even harmful.

2. Those who treat every case on the same plan, or with the same remedies (specific treatment), many of whom push their hobby to an almost dangerous extent.

3. Those who wait till the patient shows some definite symptom, which they then endeavour to relieve (the symptomatic or expectant treatment).

4. Those who advocate very active treatment, believing that early measures are most important, and that it is bad policy to wait until the patient is so ill that something *must* be done, by which time the possibility of giving relief, or of averting a calamity, may have passed.

In criticism we would say that we deplore the hopelessness of doing nothing. Although we are ready to admit that some cases get well without treatment whilst others die in spite of everything, there is yet another class of cases which would not recover without help, and in which appropriate treatment saves life.

'Specific treatment' comprises many measures which are often most beneficial; but no two cases of pneumonia are alike, and even the same case will vary greatly at different times, so that quite different methods may be necessary. It is in blindly following the same line of treatment in every case, and in every stage, that these methods fail.

With regard to pure 'expectancy', we feel that valuable time and opportunities are lost, especially in the early stages when there are usually no urgent symptoms to treat, and that by this method we lose sight of the case as a whole, regarding it rather as a collection of symptoms. Therefore:

1. It is bad policy to do nothing in every case;

2. It is often dangerous to wait for symptoms which necessitate active interference;

3. It can hardly be expected that specific plans and remedies can meet the requirements of every case alike.

When death occurs in pneumonia, it is due to toxæmia, heart failure, or the supervention of some complication. A rational treatment should, therefore, be framed on these lines: (1) *To lessen Toxæmia* by every means in our power; (2) *To Limit Extension of Pulmonary Lesion* (because it causes heart failure); (3) *To prevent or Treat Cardiac Failure*; (4) *To Prevent or Treat Complications.*

1. **To Lessen Toxæmia.**—Most authorities agree that toxæmia is, directly or indirectly, the cause of the majority of deaths occurring in cases of pneumonia. The means we have at our disposal are:—

a. Bleeding.—By withdrawing a certain amount of blood, we not only relieve the right heart, but also lessen the total amount of poison circulating.

b. Diaphoresis.—By hot baths, hot packs, and, best, by the hot foot-bath given in bed, and kept up by adding more hot water, and a little mustard, for half to three-quarters of an hour, till there is profuse sweating, which can be increased by giving copious drinks of water in the meantime.

c. Catharsis.—Calomel and saline are unequalled for this purpose. It must be remembered that, in order to get the best effects, free evacuation must be kept up (two or three times daily) for two or three days.

d. Diuresis.—The citrates are most useful in this respect, as also large quantities of bland drinks. We do not want to employ powerful remedies, because the kidneys are already congested from the fever and toxæmia (witness the almost constant albuminuria).

e. The Cleansing of the Mouth.—This is most important, so as to prevent auto-infection by the constant swallowing of bacteria, with which the mouth swarms.

Other methods of lessening toxæmia may be mentioned, as saline infusion, and the free use of oxygen for inhalation (which has a powerful effect in destroying the circulating toxins); but these methods are more useful in relieving the overtaxed heart, and should be included under treatment for cardiac failure. This is true of bleeding also.

All these measures are of a depletory nature: it must be remembered that bleeding is certainly not recommended as a routine treatment, but only in exceptionally acute, sthenic cases, when seen very early. So, too, diaphoresis, catharsis, and diuresis are applicable only in the early stages of the disease, while the powers of the patient are as yet unimpaired, and when, by promptly and effectively promoting the increased excretion of toxins, the exhaustion, heart failure, etc., which the toxæmia so frequently causes may possibly be prevented.

Emphatically it is in the earliest stages that these measures are called for. The 'expectant' treatment waits, and these golden opportunities (which never recur in cases of pneumonia) of lessening toxæmia, at a time when the measures recommended involve no risk to the individual, are lost. They should be regarded as most important preventive treatment, which may frequently prevent subsequent evils.

2. **To Limit Extension of Pulmonary Lesion.**—The importance of this lies in the fact that the wider the area affected the greater the work thrown on the right ventricle, from the consequent blocking of the pulmonary capillaries. As means, we have (locally) leeching, wet and dry cupping, and blisters, whilst certain drugs are sometimes useful in

lessening the amount of fibrin in the blood (which is increased in pneumonia). By active treatment on these lines we may succeed in limiting extension if we get our cases early enough. Although we may not get them before there is a patch of consolidation, yet we should always be on the look-out for signs of extension to another part, or to the opposite lung, and apply vigorous measures at the earliest moment, while yet there may be only a few crepitations (congestion). The drugs useful for the same purpose are iodide of potash, the alkaline carbonates, and citric acid. Citric acid, by taking up calcium, tends to prevent coagulation, whilst the alkalis and iodide of potash promote fluidity of blood. The same result is aimed at by lowering the diet and giving fluids copiously. It may be said of these measures, one does not believe in starving patients, nor in drenching them with enormous doses of iodide of potash (300 gr. daily have been given); but in sthenic cases, running an acute course, low diet and iodide of potash are certainly useful; citric acid, although theoretically active, seems practically of little use. Local methods should be applied wherever fresh signs of disease can be found. Of these one prefers leeching to any other, and it must be remembered that leeches are absolutely efficacious in removing pain (a great gain where rest is so important), whether we succeed in limiting the spread of consolidation or not.

3. **To Prevent or Treat Cardiac Failure.**—To prevent cardiac failure it is necessary to understand clearly what may cause it.

a. Toxæmia and Fever.—In this connection toxæmia is the most important. The means of lessening it have already been discussed. Fever generally goes hand in hand with toxæmia, and it is doubtful if it is well to use measures solely against the fever, such as powerful antipyretics, ice-packs, etc., because of their depressing influence on the patient.

b. Increased Resistance to the Pulmonary Circulation due to the Consolidation.—This has also been dealt with.

c. Abdominal Distention, so common in pneumonia, is less so where the bowels have been kept freely open in the early stage, as recommended. Care must be taken with the diet, as excess of milk, carbonates, and aerated waters seem to increase this tendency. Distention is most distressing to cardiac action, and if, in spite of all preventive care, it should occur, appropriate treatment must be applied. Calomel and salines should be used, and a simple enema given. If still troublesome, the long tube should be passed for its relief (for it is frequently colonic), and an enema of turpentine or asafœtida given.

d. Constant Pain, best relieved by local measures, such as leeching, cupping, and blisters, as already mentioned.

e. Restlessness, Sleeplessness, and Delirium form the most difficult problems in the treatment of pneumonia. Again, prevention is better than cure. Early in the case avoid all unnecessary moving and disturbance, and during the first few days, provided there is no distress of breathing, no cyanosis, and the kidneys are healthy, it is well to make sure that the patient shall sleep.* This can generally be secured by an evening Dover's powder. Afterwards it is a much more serious matter. Each case must be carefully weighed on its merits. There are patients in whom continued restlessness and sleeplessness wear the heart out, sedatives being withheld; while in others the sedative has caused the patient to sink into a choked and cyanotic condition. On the one hand we fear to deaden the activity of the respiratory centre, tie up secretion, and check cough; on the other we know the almost inevitable result of continued sleeplessness and exhaustion. If we feel that cardiac failure and exhaustion are threatening, and that nothing but sleep is likely to prevent them, having eliminated faulty kidneys, in the absence of cyanosis, and with no very copious bronchitis, sedatives should be used. We see much harm from the reckless use of them, but it is wrong to say that they should *never* be given. When their use has been decided upon, paraldehyde is, perhaps, the best, because the safest: to avoid its objectionable taste, it can be given per rectum in 1- to 3-drachm doses. Chloral and bromide, and chloral formamide are more frequently used; others prefer opium, morphia, or heroin. Delirium must be treated on similar lines and with the same precautions. It must be remembered that delirium is, not infrequently, entirely due to want

* N.B.—The removal of a patient to nursing home or hospital, or even changing the room or bed, though often apparently so advisable, is frequently attended with disastrous results; and should always be undertaken with every care against exhausting the patient.

of sleep, or to exhaustion, and that it will often pass away completely if sleep be obtained, or food or stimulants given.

If in spite of our care the heart begins to fail, as will be evidenced by increasing difficulty of breathing, distant or absent heart sounds, increased rapidity of pulse, which is easily compressible or dicrotic, and perhaps irregular, what means have we for stimulation? In this connection we must consider the relative merits and uses of strychnine, digitalis, pituitrin, alcohol, oxygen, and hypodermoclysis.

Strychnine should be given early, before the heart shows any sign of failure, because :—

i. It keeps the respiratory centre awake.
ii. It is a tonic to the general nervous system (as well as to the heart).
iii. It is potent to prevent abdominal distention.
iv. It is a profound and prolonged cardiac stimulant.
v. It does not tend to poison the patient.

Digitalis has been used as a specific, given early, with the idea of preventing cardiac failure and of driving the blood through the lungs, so as to overcome the inflammatory stasis. We do not advocate its use for such a purpose, but as a powerful cardiac stimulant it is almost unequalled. Unfortunately it is prone to upset the stomach, and not infrequently does harm in this way. It must be remembered that, with regard to this drug, as well as strychnine, it is frequently useless when given by the mouth. One has often seen cases, past absorbing these remedies by the stomach, immediately respond to them when given hypodermically, and in all cases where the patients are very ill, and the tongue perhaps dry and brown, hypodermic medication is indicated. In such cases, the best way of using our three most powerful cardiac stimulants is by the triple injection of digitalin, strychnine, and pituitrin : thus :—

℞ Pituitrin, Digitalin — 1 ampoule, gr. $\frac{1}{100}$ | Strychnine — gr. $\frac{1}{60}$ to $\frac{1}{30}$

Every eight, six, or four hours as may be needed.

The hypodermic tablets of digitalin and strychnine readily dissolve in the ampoule of pituitrin, facilitating their triple employment in this way.

Alcohol.—Whilst much harm is done by the reckless use of alcohol, and also whilst acknowledging the fatality of the disease amongst chronic alcoholics, one still feels, occasionally, the necessity for its employment. The pernicious habit of putting every pneumonic patient on anything up to a bottle of brandy a day is responsible for a good many cases of delayed resolution, or even permanent damage to the lungs; whilst it seems, in many cases, to increase the toxæmia, to develop uræmic symptoms, or to cause great restlessness, excitement, or even delirium, at the same time doing away with the desire for more useful nourishment, and causing stomach distention. Therefore, one deprecates its abuse, or even its routine employment, especially early in the case. Further, it may be urged that alcohol throws more work on the kidneys, which, as we know, are frequently already allowing albumin to pass. These are the dangers and difficulties surrounding the use of alcohol; personally, we prefer strychnine and digitalis for cardiac stimulation before resorting to it. A further use of alcohol must be mentioned, and that is its use as a soporific. Where rest and sleep are so important, and where one finds, as sometimes is the case, that nothing calms the restlessness so well as some form of alcohol, we feel bound to use it for this purpose.

Oxygen, one believes, is frequently left till too late. Its beneficial action against toxæmia has already been mentioned, whilst its great stimulating effect on the heart through the blood is undoubted. It should be used freely. It is best given without a mask, just through a plain tube, and should always be washed and warmed by being passed through a bottle of warm water. Stimulants, such as ether and alcohol, are sometimes used intead of water for the oxygen to pass through, so as to get the combined beneficial effects of the oxygen and stimulant used.

Many other drugs have been used for stimulating the failing heart in cases of pneumonia, such as strophanthus, musk, nitroglycerin, camphor, etc., etc., but it would not seem that they have any claim to superiority over those already discussed. Finally, the question of injection of saline solution may suggest itself. This measure is undoubtedly very powerful in stimulating the heart. Normal saline solution (1 drachm to a pint) may

thus be injected into the rectum, or beneath the skin (hypodermoclysis), or directly into a vein, being most powerful when used intravenously. From one to four pints, carefully sterilized, and at a temperature of 100°, may be used in this way.

4. **To Prevent and Treat Complications.**—It is not within the scope of this article to discuss these, as it would involve the consideration of pericarditis, pleural effusion, empyema, abscess and gangrene of lung, meningitis, arthritis, phlebitis, and other affections, which may be referred to. But one wishes to emphasize the point that, because a serious complication of the pneumonia may occur, it is not therefore necessary to abandon hope and discontinue treatment. We see cases complicated with pericarditis, meningitis, empyema, or even abscess of the lung, not infrequently get well. Each complication will call for its particular treatment; but do not in the meantime lose sight of the fact that the case is one of pneumonia.

Specific Therapy.—It is not possible to speak definitely with regard to this method. We know: (1) That a certain amount of immunity can be conferred in the case of animals, and from the use of serum in the South African War it would seem that a slight immunity can also be conferred on man, but that it is short in duration (that is, prevention). (2) That its use in patients suffering from the disease is rendered difficult by the fact that each individual breeds his own particular strain of pneumococcus. Bearing in mind this fact, viz., that A's pneumococcus does not protect B, and that it therefore becomes necessary to cultivate an individual's own organism for his own cure (a process which takes several days), it is obvious that this form of treatment will become more useful in lingering cases, or for some of the more chronic complications, such as empyema, delayed resolution, or arthritis; and that there would be no time to call in its aid in the ordinary case, swiftly fulminating in death or resolution. Thus we have seen cases of pneumococcal empyema and arthritis treated most successfully by this method. (*See also* SPECIFIC THERAPY.)

Preventive Treatment.—It is only necessary to mention this to remind practitioners of its importance. We recognize that, at any rate in certain circumstances, pneumonia is an infective disease. It is therefore obvious that care should be taken, in every case, to destroy all emanations from the patient—especially the sputa, which should be burned. Elaborate precautions as to isolation may not be necessary, but undoubtedly the spread from case to case does occur, sometimes assuming epidemic proportions.

DIGITALIS AND STRYCHNINE FOR CARDIAC FAILURE IN PNEUMONIA.

℞	Tincturæ Digitalis		Spiritus Ætheris Sulph.	āā ♏xv
	Tincturæ Nucis Vomicæ	āā ♏v	Infusi Cinchonæ	q.s. ad ℥j
	Spiritus Ammoniæ Aromatici			

M. Ft. mist. ℥j sextis horis.

FOR CATARRHAL PNEUMONIA.

℞	Vini Antimonii	♏xv	Syrupi Aurantii	℥j
	Ammonii Chloridi	gr. x	Aquam Camphoræ	ad ℥j
	Spiritus Chloroformi	♏x		

M. Ft. mist. ℥j ter die.

(*Vict. Park Hosp. Pharm.*)

ANTISEPTIC AND STIMULANT, ADVOCATED BY MANY IN RECENT INFLUENZAL CASES.

℞	Creasoti	♏ij–iij	Tincturæ Nucis Vomicæ	♏vij
	Spiritus Vini Rectificati	♏xv	Extracti Glycyrrhizæ Liquidi	℥ss–j
	Spiritus Ammoniæ Aromatici	♏xv	Infusum Cinchonæ	ad ℥ss
	Spiritus Ætheris	♏x		

M. Ft. mist. ℥ss three or four times a day in water.

FOR RESPIRATORY FAILURE.

℞	Quininæ Sulphatis	gr. xxiv	Glycerini	℥iij
	Strychninæ	gr. ¼	Liquoris Pepsini	q.s. ad ℥iv
	Acidi Hydrochlorici Diluti	♏xv		

M. Ft. mist. ℥j in water every three or four hours for a child of five years. (*Pepper.*)

W. J. Hadley.

PNEUMOTHORAX.—The immediate results of the formation of a pneumothorax may be either profound shock, or a disturbance so slight as not to be noticeable, with many intermediate degrees. Pneumothorax is often not recognized during life, even by experts, when it is superadded to advanced pulmonary disease. If it occurs in a patient whose lungs are not widely damaged, the shock is marked. Three points in treatment deserve attention :—

1. *Stimulants.*—These should be freely given, both alcohol and ammonia and ether. They help the heart to tide over the extra strain suddenly thrown on the right ventricle, and the dilatation consequent on the one lung being put out of action. The heart is further hampered by its displacement, which sometimes is great. According to the condition of the pulse, digitalis and strychnine may both be given, but it is not wise to contract the arteries overmuch.

2. *Morphia.*—This is the best form in which to give opium. It may be used either hypodermically or by the mouth. It helps to relieve the patient's anxiety, and there is not, to any considerable extent, danger of its interference with the respiratory centre, which is usually in good condition in those cases where pneumothorax produces its most alarming symptoms, i.e., in relatively early lung disease.

3. If there are considerable cardiac displacement and cyanosis, and the signs point to great air-pressure in the damaged pleural cavity, it is well to allow some of the air in the pleura to escape ; this may be done by a fine trocar and cannula. There are three objections to this proceeding, none of which is really important :—

a. The air will collect again most probably ; this is no reason for not giving the patient temporary relief.

b. The opening in the visceral pleura, which may be on the point of closing, is likely to be reopened. There is no chance whatever of any firm closing of the pneumothorax orifice within the first few days after its rupture. It is at this time that the air-pressure is great, and that puncture may be advisable.

c. Subcutaneous emphysema may be produced. It may ; but it very rarely occurs, and the risk is worth taking.

Besides these three methods of procedure, it is sometimes advisable to have recourse to *bleeding*. This is not often to be recommended. If there be extreme cyanosis, with a bounding heart and thready pulse, all pointing to an over-burdened right heart and blocking of blood on the venous side, the letting of fifteen to twenty ounces of blood produces great relief. Dry cupping, or the application of a few leeches, is helpful both in relieving pain and in aiding to some extent the right ventricle.

Strapping the side, which has been widely recommended and used, is not, in my experience, of any value. It has the obvious disadvantages of making the patient uncomfortable, and examination difficult. If, however, it is found that pressure applied to the damaged side of the chest relieves the patient, it should be tried.

After the first shock is over, the character of the case changes considerably. Fluid generally collects, and partially or entirely fills the pleura. The fluid may be clear or purulent, generally becoming purulent ultimately. The pus may be sweet or fœtid.

Cases where the Pleura becomes entirely filled with Fluid.

1. If the fluid be clear, or very thin pus, the temperature normal, and there be no marked distress of respiration, it is well to let it remain untouched for three or four weeks, by which time the opening in the visceral pleura may be firmly closed. Sometimes the fluid then becomes absorbed. If it does not, repeated aspiration should be tried ; if the lung will not expand and the fluid refills the pleura again and again, extrapleural thoracoplasty should be considered. Most of these cases are tuberculous, and if the pleural cavity be opened a persistent sinus may result.

2. If the fluid be purulent, temperature raised, and the patient show all the signs of pus absorption, there is no use in delay, and he should be operated on at once. This is obviously all the more necessary when the pus is fœtid.

Cases where the Pleura does not become filled with Fluid, purulent or otherwise.

These form the bulk of the chronic cases which give the classical signs of pneumothorax. Many patients remain some time in this condition, without much suffering. Their temperature is normal, or nearly so ; there is no pressure of pus in the pleura. If then, the opposite lung works well, there is no need to interfere.

If the condition change, temperature rise, and pus absorption begin, then operation should be advised.

Many of the patients do badly after operation; but that is caused by the normal progress of the disease: there is, in my opinion, no evidence to support the rather widely held doctrine that operation hastens the end in these cases. *Cecil Wall.*

POISONING.—The most convenient emetics to use in cases of poisoning are:—

Salt, a tablespoonful in a tumblerful of tepid water, repeated until vomiting occurs.
Mustard, a tablespoonful in ½ pint of warm water.
Sulphate of Zinc, 30 gr. dissolved in water.
Powdered Ipecacuanha, 30 gr. in water.
Apomorphine, $\frac{1}{10}$ to ¼ gr. hypodermically.
Sulphate of Copper, 5 to 10 gr. in water.

The following are brief directions for the treatment of different forms of poisoning:—

Acetanilide or Antifebrin—Emetic or stomach tube. Subcutaneous injection of strychnine $\frac{1}{25}$ gr.; warmth. If cyanosis—oxygen, alcohol.

Acid, Arsenious.—(*See* Arsenic.)

Acid, Carbolic.—Stomach tube, or apomorphine hypodermically; sodium sulphate, 1 oz., or magnesium sulphate, ½ oz. in 3 oz. of water; saccharated lime-water 1 oz. in 3 oz. of water.

Later: demulcent drinks; olive oil; brandy subcutaneously or by enema; warmth.

Acid, Chromic.—

Immediate treatment: stomach tube with extreme care; chalk mixture, 5 oz.; or chalk, ½ oz. in half a pint of milk.

Later: olive oil; or milk, or gruel, or white of egg and water.

Acid, Hydrochloric (Spirits of Salts).—

Immediate treatment: introduce water, and use stomach tube with care; sodium bicarbonate, 2 drachms in 5 oz. of water; or soap and water; or chalk or calcined magnesia, ½ oz., in ½ pint of water or milk; or liquor ammoniæ or sal volatile, freely diluted; or white of egg and water; milk; gruel; arrowroot; or linseed tea.

Later: morphine for pain, and ice for thirst.

Acid, Hydrocyanic.—

Immediate treatment: dash cold water over head and chest; emetic; inhalation of ammonia; brandy, by mouth or rectum; artificial respiration; faradic current; hypodermic injection of liquor atropinæ sulphatis, 2 min.

Acid, Nitric.—

Immediate treatment: soap and water, calcined magnesia, chalk, whiting, or carbonate of soda with water.

Later: demulcents—olive oil, white of egg, morphine hypodermically.

Acid, Oxalic.—Stomach tube with care; chalk, ½ oz. in 5 oz. of water; or saccharated lime-water, 4 drachms in 2 oz. of water, repeated every half-hour for eight doses; stimulants hypodermically; gruel or linseed tea.

Acid, Sulphuric.—

Immediate treatment: soap and water, calcined magnesia, chalk, whiting, or carbonate of soda with water.

Later: demulcents—olive oil, white of egg; morphine hypodermically.

Aconite.—

Immediate treatment: emetic, or stomach tube; subcutaneous injection of tincture digitalis 20 min., or digitalin $\frac{1}{100}$ gr.

Later: brandy, warmth, friction, artificial respiration.

Alcohol.—

Immediate treatment: stomach tube, cold effusions to head.

Later: hot strong coffee; warmth.—(*See also* Alcoholism, p. 19.)

Almonds, Bitter, Essential Oil of.—(*See* Acid, Hydrocyanic.)

Ammonia.—(*See* Caustic Potash and Soda.)

Aniline.—Stimulants; artificial respiration; bleeding and intravenous injection of warm saline solution (1 drachm of common salt to 1 pint of warm water).

Antimony.—Stomach tube or emetic, if required; glycerin of tannic acid, 2 fluid drachms in 5 oz. of water; or tannic acid, 30 gr. in 5 oz. of water, to be repeated if vomited; strong tea or coffee, ½ pint; milk; stimulants; hot bottles and blankets; friction.

Later: morphine.

Antipyrin.—(*See* Phenazone.)

Aqua Fortis.—(*See* Acid, Nitric.)

Arsenic.—

Immediate treatment: emetic or stomach tube; ferric hydrate (prepared by mixing liq. ferri perchlor. ½ oz. in ½ tumblerful of water with equal quantity of saturated solution

of washing soda; collect precipitate on a handkerchief and mix with ½ tumblerful of hot water), repeat frequently. (Liquor ammoniæ may be used instead of washing soda.)

Atropine.—Stomach tube or emetic; brandy; 1 pint of strong, hot coffee; morphine hypodermically, ⅛ gr., to be repeated in two hours; or hypodermic injection of pilocarpine (½ gr. of pilocarpine nitrate), to be repeated in fifteen minutes, if pulse improves; flicking; pinching; warm and cold douche; faradism; hot bottles and blankets; artificial respiration; friction.

Barbitone.—Stomach tube or emetics; castor oil or enemata; introduce tannin solutions into the stomach (e.g., tinct. catechu, 1 drachm); hot coffee and camphor injections as stimulants; digitalin and strychnine for collapse; oxygen for cyanosis.

Barium, Salts of.—Stomach tube or emetic; sodium sulphate, 1 oz., or magnesium sulphate, ½ oz., in 5 oz. of water; or alum, 1 drachm in 5 oz. of water; stimulants; hot bottles and blankets.

Later: morphine.

Battle's Vermin Killer.—(*See* STRYCHNINE.)

Belladonna.—(*See* ATROPINE.)

Benzol.—

Immediate treatment: emetic, stomach tube.

Later: brandy; inhalation of ammonia; subcutaneous injection of liquor atropinæ sulphatis, 2 min.

Bichromate of Potash.—Stomach tube or emetic; chalk mixture, 8 oz.; or ½ oz. of chalk in ½ pint of milk; warm bottles and blankets.

Burnett's Disinfecting Fluid.—(*See* ZINC, SALTS OF, and ACID, HYDROCHLORIC.)

Calabar Bean.—(*See* PHYSOSTIGMINE.)

Camphor.—

Immediate treatment: emetic and stomach tube.

Later: inhalation of ammonia; subcutaneous injection of brandy; hot fomentations.

Cannabis Indica.—Emetic, stomach tube; apomorphine hypodermically; stimulants.

Cantharides—

Immediate treatment: stomach tube or emetic.

Later: demulcents; opium; morphine.

Carbolic Acid.—(*See* ACID, CARBOLIC.)

Carbonic Acid.—Fresh air; artificial respiration; inhalation of vapour of liquor ammoniæ; stimulants; hot bottles and blankets; inhalations of oxygen; bleeding; faradism; cold douche.—(*See also* DROWNED, TREATMENT OF THE APPARENTLY.)

Carbonic Oxide.—Fresh air; artificial respiration; bleeding and intravenous injection of warm saline solution (1 drachm of common salt to 1 pint of warm water); inhalation of oxygen; stimulants; hot bottles and blankets; friction; faradism.

Caustic Potash and Soda.—Stomach tube, with care; vinegar or diluted acetic acid, or lemon-juice; olive oil.

Cesspool Gas.—(*See* SEWER GAS.)

Chloral Hydrate.—

Immediate Treatment: prevent sleep by wet towel to face, head, and neck; emetic and stomach tube; hot blankets; hot bottle to feet.

Later: hot strong coffee; artificial respiration; faradic current; subcutaneous injection of liquor strychninæ hydrochloratis, 4 min.; nitrite of amyl; oxygen.

Chlorine, Inhaled.—Inhalations of ammonia or sulphuretted hydrogen.

Chlorine, Swallowed.—Albumin and mucilaginous drinks.

Chloroform, Inhaled.—Insert finger into mouth and pharynx to make sure that there is no obstruction, e.g., by artificial teeth; extend the head, and push the jaw forward; pull tongue out by forceps; loosen clothes; fresh air; artificial respiration; raise foot of table that the head may be lower than the rest of the body; flapping with wet towels; inhalation of capsule of amyl nitrite; faradism (poles at pit of stomach and over larynx); strychnine; ether; alcohol, hypodermically; brandy enema.

Chloroform, Swallowed.—Stomach tube or emetic; olive oil; stimulants hypodermically or per rectum; flapping with wet towels; faradism; 1 pint of strong, hot coffee; capsule of amyl nitrite for inhalation.

Chlorodyne.—(*See* OPIUM.)

Coal Gas.—Fresh air; artificial respiration; stimulants; hot, strong coffee; oxygen inhalation; ammonia inhalation; transfusion.

Cocaine.—Emetic, if swallowed; stimulants; inhalations of amyl nitrite.

Colchicum.—Emetic; olive oil or any demulcent; stimulants.

Conium (Hemlock).—Emetics; stimulants; strychnine hypodermically; artificial respiration.

Copper, Salts of.—

Immediate treatment: white of egg and warm water; milk; emetic and stomach tube if vomiting has not occurred.

Later: demulcents; morphine or laudanum, and hot fomentations if much pain.

Corrosive Sublimate.—Stomach tube, with great care; flour and water; or arrowroot and water; or white of egg and water (1 egg = 4 gr. of corrosive sublimate); stimulants; hot bottles and blankets.

Later: morphine.

Creasote.—(*See* Acid, Carbolic.)

Croton Oil.—Stomach tube or emetic; stimulants; ½ gr. of morphine hypodermically; or tincture of opium, 30 min. by mouth, by rectum, or by suppository; morphine; hot bottles and blankets; friction; poultices or hot fomentations to abdomen.

Cyanide of Potassium.—Stomach tube or emetic; ferrous sulphate, 5 gr. in 5 oz. of water; stimulants hypodermically; faradism; inhalation of vapour of liquid ammonia; artificial respiration; fresh air; solution of atropine sulphate, 2 min. hypodermically (= $\frac{1}{50}$ gr. of atropine sulphate); or tincture of belladonna, 15 min. by mouth or rectum; alternate warm and cold douches; friction.

Dalby's Carminative.—(*See* Opium.)

Deadly Nightshade.—(*See* Atropine.)

Digitalis (Foxglove).—Emetics; tannin, 30 gr. in water; stimulants; recumbent position; tincture of aconite internally.

Elaterium.—Emetics; stomach tube; demulcent drinks; opium.

Emerald Green.—(*See* Arsenic.)

Eserine.—(*See* Physostigmine.)

Ether.—(*See* Chloroform.)

Fly Papers.—(*See* Arsenic.)

Formalin.—Small doses of ammonia largely diluted with water; or large quantities of liquor ammonii acetatis every half hour.

Foxglove.—(*See* Digitalis.)

Fungi.—Emetics; hypodermic injection of liquor atropinæ sulphatis, 2 min.; stimulants.

Gelsemium.—Stomach tube; emetics; potassium bicarbonate and tannin; warmth, stimulants; artificial respiration; solution of atropine, 3 min. hypodermically.

Gibson's Vermin Killer.—(*See* Strychnine.)

Godfrey's Cordial.—(*See* Opium.)

Henbane (Hyoscyamus and Hyoscine).—(*See* Atropine.)

Iodine.—

Immediate treatment: emetic and stomach tube.

Later: starch and water; demulcents; nitrite of amyl; morphine and fomentations for pain.

Iodoform.—Emetics; stomach tube; bicarbonate of soda in large diluted doses; stimulants; hot pack; subcutaneous injection of saline solution.

Laburnum.—Stomach tube; stimulants; hypodermic injection of ammonia; counter-irritation; friction; cold douche.

Lead, and its Compounds.—

Immediate treatment: stomach tube or emetic; magnesium sulphate, ½ oz., or sodium sulphate, 1 oz., in 5 oz. of water; or diluted sulphuric acid, 30 min. in half pint of water; milk; or white of egg and water; poultices to abdomen; morphine.

Later: potassium iodide.

Lime.—Carbonic acid; any aerated water; weak acetic acid or vinegar; oil or demulcent drinks.

Lobelia.—Stomach tube or emetic, if required; recumbent position; glycerin of tannic acid, 2 drachms in 5 oz. of water; or tannic acid, 30 gr. in 5 oz. of water; or 1 pint of strong tea; stimulants; hot bottles and blankets; friction; tincture of nux vomica, 15 min. by mouth or rectum; or solution of strychnine hydrochloride 5 min. hypodermically (= $\frac{1}{20}$ gr. strychnine hydrochloride).

Mercury, Salts of.—(*See* Corrosive Sublimate.)

Morphine.—(*See* Opium.)

Mother's Friend.—(*See* Opium.)

Muriatic Acid.—(*See* Acid, Hydrochloric.)

Muscarin.—(*See* Fungi.)

Mushrooms.—(*See* Fungi.)

Mussel Poisoning.—Emetic; stimulants; solution of atropine, 2 min. hypodermically; castor oil, 2 oz., with 10 min. tincture of opium.

Nepenthe.—(*See* Opium.)

Nicotine.—

Immediate treatment: stomach tube or emetic; stimulants; warmth; artificial respiration; strychnine hypodermically.

Later: stimulants.

Nitric Acid.—(*See* Acid, Nitric.)

Nitrobenzene (or Nitrobenzol).—Stomach tube or emetic; stimulants; solution of atropine sulphate, 2 min. hypodermically (= $\frac{1}{50}$ gr. of atropine sulphate); artificial respiration; faradism.

Nitroglycerin.—

Immediate treatment: recumbent posture; cold affusion.

Later: hypodermic injection of ergot, 3 min., or solution of atropine sulphate, 2 min. hypodermically.

Nitrous Oxide Gas.—Insert finger into mouth and pharynx to make sure that they are free from obstruction, e.g., by artificial teeth, gag, etc.; extend the head, and push the jaw forward; pull tongue out by forceps; fresh air; loosen clothes; if patient is upright, place in recumbent position; artificial respiration; flapping with wet towels; inhalation of oxygen.

Nux Vomica.—(*See* STRYCHNINE.)

Opium (or **Morphine**).—Apomorphine hypodermically. Stomach tube or emetic; wash out stomach with solution of potassium permanganate, diluted with 5 times the quantity of warm water, leaving about 5 oz. of the diluted solution in the stomach; strong hot coffee, 1 pint by rectum; ether, 60 min. hypodermically; liquor ammoniæ or smelling salts to nostrils; faradism; make patient walk about; solution of atropine sulphate, 3 min. hypodermically ($=\frac{3}{100}$ gr. of atropine sulphate), to be repeated in half an hour; or tincture of belladonna, 15 min. by mouth or rectum; artificial respiration.

Oxalic Acid.—(*See* ACID, OXALIC.)

Paraffin Oil.—Emetics; stimulants; hot bottles and blankets; friction.

Paraldehyde.—(*See* CHLORAL.)

Petroleum.—Emetics; stimulants; friction; hot bottles and blankets.

Phenazone (**Antipyrin**).—Stomach pump; brandy; subcutaneous injection of strychnine, $\frac{1}{20}$ gr.; warmth. If cyanosis—oxygen.

Phenol.—(*See* ACID, CARBOLIC.)

Physostigmine.—Emetics; 30 gr. tannin in water; 2 min. solution of atropine sulphate hypodermically; or tincture of belladonna, 15 min. by mouth every fifteen minutes until pupils dilate; chloral hydrate; stimulants; artificial respiration; solution of strychnine, 5 min. hypodermically.

Phosphorus.—Stomach tube or emetic; oil of turpentine, 20 min., repeated every half-hour for six doses; or solution of hydrogen peroxide 30 min. repeated; purgative of $\frac{1}{2}$ oz. of magnesium sulphate; linseed tea. Avoid oils and fats.

Pilocarpine.—Stomach tube or emetic; tannin; hypodermic injection of atropine, $\frac{1}{40}$ to $\frac{1}{20}$ gr. doses.

Potash, Caustic.—(*See* CAUSTIC POTASH.)

Potassium Chlorate.—Stomach tube or emetics; demulcent drinks; purgatives; warmth; hot pack.

Rat Pastes.—(*See* ARSENIC, and PHOSPHORUS.)

Salts of Lemon, Salts of Sorrel.—(*See* ACID, OXALIC.)

Santonin.—

Immediate treatment: stomach tube or emetic; stimulants. If convulsions, chloral and bromide of potassium.

Later: stimulants.

Savin.—

Immediate treatment: emetic.

Later: demulcents; castor oil; opium or morphine.

Sewer Gas.—Fresh air; artificial respiration; stimulants; strong, hot coffee, 1 pint by mouth or rectum; hot bottles and blankets; faradism.

Silver, Salts of.—Common salt, $\frac{1}{2}$ oz. in a pint of water; stomach tube; white of egg and water; milk.

Simpson's Rat Paste.—Contains 40 per cent of arsenious acid. For treatment see ARSENIC.

Snake Bites.—(*See special article.*)

Soap Lees.—(*See* CAUSTIC POTASH.)

Soda, Caustic.—(*See* CAUSTIC POTASH AND SODA.)

Soothing Syrup.—(*See* OPIUM.)

Spirit of Hartshorn.—(*See* CAUSTIC POTASH.)

Stramonium.—Emetics; tannin; stimulation; morphine hypodermically.

Strychnine.—

Immediate treatment: wash out stomach at half-hour intervals with solution of permanganate of potash diluted three times with warm water; emetic and stomach tube; injection of apomorphine, 5 min. hypodermically; bromide of potassium, 1 drachm in water every half-hour; chloral hydrate hypodermically, 5 gr. repeated, or by rectum; chloroform inhalations.

Later: inhalation of chloroform, if convulsions are very severe; artificial respiration. —(*See also* CRAMP.)

Sugar of Lead.—(*See* LEAD.)

Sulphuretted Hydrogen.—(*See* SEWER GAS.)

Sulphuric Acid.—(*See* ACID, SULPHURIC.)

Tartar Emetic.—Stomach tube; tannin, 30 gr. in water; vegetable astringents; tea; coffee.

Later: stimulants.

Tobacco.—Emetic; tannin; hypodermic injection of strychnine, $\frac{1}{20}$ gr.; stimulants; recumbent position.

Turpentine.—Stomach tube or emetic; magnesium sulphate, $\frac{1}{2}$ oz. in 2 oz. water; demulcents.

Later: morphine.

Vegetable Irritants.—(Where symptoms of gastro-intestinal irritation follow the ingestion of some vegetable product.)—Stomach tube or emetic; glycerin of tannic acid, 2 drachms in 5 oz. of water; or tannic acid, 30 gr. in 5 oz. of water; white of egg; or gruel; linseed tea; arrowroot; stimulants; hot bottles and blankets; friction.

Later: morphine.

Veratrine.—Stomach tube or emetic; glycerin of tannic acid, 2 drachms in 5 oz. of water; or tannic acid, 30 gr. in 5 oz. of water; stimulants; enema of warm coffee, $\frac{1}{2}$ pint; hot bottles and blankets; recumbent position.

Verdigris.—(*See* COPPER, SALTS OF.)
Vermin Killers.—Battle's contains 10 per cent of strychnine; Butter's contains 5 per cent of strychnine; Roth and Ringeinsen's contains phosphorus and arsenic; Simpson's contains 40 per cent of arsenious acid. Many contain arsenic, and, exceptionally, barium carbonate.
Veronal.—(*See* BARBITONE.)
Vitriol, Blue.—(*See* COPPER, SALTS OF.)
Vitriol, White.—(*See* ZINC, SALTS OF.)
White Precipitate.—Treatment as for CORROSIVE SUBLIMATE.
Yew.—(*See* VEGETABLE IRRITANTS.)
Zinc, Salts of.—White of egg; washing soda in dilute solution; demulcents; strong tea; hot fomentations; morphine.

Robert Hutchison.

POLIOMYELITIS AND ENCEPHALITIS, ACUTE.—This disease is now recognized as one of the acute specific fevers, having an incubation period of from 4 to 12 days, and liable to be communicated from person to person. The causal organism of the disease has been obtained in culture and its characters described by Flexner and Noguchi. It belongs to the class of filtrable viruses.

There is some, but at present incomplete, experimental evidence that the disease may be carried by the stable fly (*Stomoxys calcitrans*). In dealing with the acute stage of this disease it is advisable to keep the individual isolated, and to take such precautions as would be adopted in nursing a case of typhoid. No statement based on bacteriological evidence can be made as to how long such precautions should be continued, but a period of at least fourteen days from the subsidence of the temperature to normal should be insisted on. It must be recognized that this disease may manifest itself simply by malaise, fever, and sore throat, of short duration; or it may affect any part of the nervous system, giving rise to a variety of symptoms, slight or severe, due to lesions spinal, cerebral, cerebellar, or meningeal. Various members of a family may be affected, and will exhibit a variety of symptoms.

The disease may, for the convenience of describing the method of treatment, be divided into three stages: (1) *The acute stage;* (2) *The stage of recovery;* (3) *The late stage.*

1. **The Acute Stage.**—The patient should be kept in bed and allowed to lie in whatever position is most restful. It is a mistake to insist on the prone position, however advisable it may seem to be from theoretical considerations. The bowels should be evacuated by calomel, or a glycerin suppository or enema. If fever be present, the diet should be fluid. Pain is often severe, especially on movement; and this symptom in cases seen during the acute stage often suggests that the case is one of acute rheumatism. It can often be relieved by careful support of the limbs by a water bed, and freedom from all movement. Hot applications may be of some service. Acetylsalicylic acid or salicylate of soda in 5- to 10-gr. doses every four hours is a most valuable remedy for this symptom. Lumbar puncture may be performed, but it is quite uncertain in its result as to the relief of pain; in those cases in which the fluid is under pressure, pain is generally relieved. In the severest cases morphia is needed.

All cases of acute poliomyelitis should be given 5 to 10 gr. of hexamine every four hours during the acute stage; for it has been shown experimentally that the drug passes into the cerebrospinal fluid and prevents the extension of the disease. It can with safety be given in the above doses to quite young children. In dealing with acute ascending forms of poliomyelitis, it would be well to use the intrathecal injections of serum obtained from a recovered case of poliomyelitis; for this has been used by Netter, and appeared to have a marked effect in limiting the spread of the disease.

When the disease is of wide extent and has affected the muscles of the thorax, the upper extremity, and neck, great care should be exercised in feeding the patient. Should there be any evidence of failure of the closure of the glottis in deglutition, it is advisable to feed with a nasal tube. A patient with an attack of acute poliomyelitis should be kept at rest in bed for at least *four weeks.*

2. **The Stage of Recovery.**—After the acute stage, which usually lasts from five to ten days, has passed, recovery begins to take place. The treatment during this period consists in (*a*) Muscular relaxation; (*b*) Massage; (*c*) Passive and resistance movements; (*d*) Exercises; (*e*) Electricity; (*f*) Warmth to the limbs; (*g*) Drugs.

a. Muscular Relaxation.—The importance of relaxation of paralyzed muscles is generally admitted. Splints are of great value in this connection. These are used, firstly, to keep the paralyzed muscles at rest and to prevent their being stretched; secondly, to prevent the occurrence of deformity; and thirdly, if the lower limbs are paralyzed, to help the patient to walk. For this purpose there is no doubt that a celluloid splint, which is made to fit the limb accurately, is the best; it is light, can be worn day and night, can be easily removed for the application of massage and movements, is easily replaced, and also aids the patient in walking (*Fig.* 56). Such splints should be used not only for the legs, but also for the arm and trunk if the muscles of these are paralyzed. For details as to the making and use of these splints, reference may be made to *The Clinical Journal*, 1913, xlii, 529.



Fig. 56. — Celluloid splints reaching from the foot to the groin. Note the flexion of the splint at the knee, and the shoes worn over the splint.

b. Massage.—In those cases in which there is no pain on movement and no elevation of temperature, massage may be begun about ten to fourteen days after the onset of the disease; in many cases, however, owing to the pain, it is quite impossible to begin for three or five weeks, or even longer.

c. Passive and Resistance Movements.—These movements are of the greatest importance, not only in giving a physiological stimulus to aid the muscle in recovery, but also in tending to prevent the occurrence of deformity. Passive movements should be followed by active movements. The patient should be encouraged to make a movement against resistance. In many instances he is at first quite unable to perform any movements with the paralyzed leg. In this event, both legs should be held by the masseuse, and the patient told to attempt to extend and flex both legs against this resistance. In this manner, movement of the paralyzed limb can be sometimes brought out which the patient cannot otherwise produce.

d. Exercises.—From the end of the fourth to sixth week after the onset of the disease it is well to get the patient to perform exercises. The form of these must depend upon the muscles paralyzed.

Walking exercises are good so long as the limbs are so splinted that no deformity can occur. In those cases in which there is considerable paralysis of both legs, so that the patient cannot stand without support, both legs should be splinted from the heel to the groin, and a walking apparatus such as is shown in *Fig.* 57 should be used.



Fig. 57.—Form of walking apparatus used in encouraging children to make an attempt to walk.

Complete rest for many months with the limbs in a fixed position has been advocated by some observers; but the above method of treatment is more advantageous *so long as the limb is so splinted that no deformity can arise.*

e. Electricity.—If the paralyzed muscles react to faradic stimulation, it is advisable to use this form of current for treatment; if on the other hand the muscles react to galvanism alone, then that form of current should be used, and the pole, negative or positive, which causes the most active contraction, should be applied over the muscle, the current being made to vary rhythmically or interrupted by a make-and-break key. If a contraction cannot otherwise be obtained, the current may be alternately reversed. The sinusoidal and condenser discharges are considered by some to be less painful and more effectual than other forms of current. The application of faradism is best carried out by two electrodes applied to the paralyzed muscle. The galvanic current may be applied in a similar manner, or the positive pole may be placed on the back and the negative pole moved slowly up and down over the paralyzed muscle. The application of the galvanic current can also be conveniently made in a bath. (*See* ELECTROTHERAPEUTICS.)

In the case of young children, electrical treatment is often inapplicable, because of the pain produced by an electric current sufficiently powerful to produce a muscular contraction.

Although it is generally advisable to apply faradism to muscles which react to such a current, yet there are some exceptions. In a case, e.g., in which there is considerable affection of the muscles below the knee, it may be found that the gastrocnemius and soleus muscles respond to faradic stimulation, whereas the anterior tibial group responds only to galvanism. In such a case galvanism should be used only to the anterior tibial group of muscles, and no form of stimulation employed for the posterior group; for the stimulation, and consequent contraction, of the gastrocnemius tends to stretch the anterior tibial group and produce an equinus.

f. Warmth.—The attention of the parent and nurse should, in the case of children, be especially directed to this point. Warm baths and douches are useful, but it is of still greater importance to maintain the temperature of the limbs during the day and night by loose woollen garments, and by frequent rubbing of the limbs. A warm, equable climate will also be beneficial, but home comfort and convenience should not be sacrificed for the sake of climate.

g. Drugs.—Apart from general tonics, such as iron, cod-liver oil, and maltine, the only drug which seems to be beneficial is strychnine. This may be given at first in doses of $\frac{1}{100}$ gr. and gradually increased.

3. **The Late Stage.**—During this period the treatment consists in: (*a*) Mechanical support; (*b*) Division of tendons; (*c*) Nerve resection and reunion; (*d*) Resection of a joint; (*e*) Transplantation of tendons; (*f*) Amputation.

a. Mechanical Support.—During the early stage of the disease the limb should be placed in a celluloid splint to keep the paralyzed muscles at rest and to prevent deformity; and in the later stage, this same splint will answer the purpose of mechanical support and enables the patient to walk. Celluloid splints may in some cases, and especially in the case of young children, be worn for two to four years after the acute attack with advantage; but in those cases which still require a mechanical support after two years, it is probable that an instrument fitted with a movable joint is more convenient and gives the patient a greater play of movement. In those cases in which the muscles about the hip-joint are much affected, so that there is difficulty in maintaining the erect position, a steel instrument is of greater service than a celluloid splint.

b. Division of Tendons.—In many cases, before any mechanical support can be applied, division of one or more tendons is required. The simple shortening or lengthening of a tendon will in some cases greatly increase the usefulness of a limb—apart from any other measure. The more carefully a limb is splinted in the early stages of the disease, the less will tenotomies be required.

c. Nerve Resection and Reunion.—The principle of this operation depends upon the observation that when the proximal end of a degenerated nerve is connected with the distal end of a nerve in connection with a healthy nerve centre, the peripheral portion of the nerve regenerates, and hence impulses are able to pass from the centre to the muscles. The successful application of such an operation depends on several factors. First, on the possibility of obtaining a healthy nerve in proximity to the degenerate nerve; secondly, on the paralyzed muscle retaining muscle fibres capable of regeneration when normally innervated; and thirdly, that the interference with the healthy nerve will give rise to no loss of power of serious importance. As may be readily understood, the number of cases in which such treatment is applicable is small, and they are most likely to be found among those in whom the disease has affected the muscles of the upper extremity. The operation should be performed before the sixth month after the onset of the disease. No improvement is to be expected in the condition of the muscle for at least six months after the operation. The results obtained from this operation, which has been but seldom carried out, are not encouraging, the percentage of improvements being very small.

d. Resection of a Joint.—The object of this operation is to give a fixed instead of a flail-like joint, and thus dispense with the necessity of mechanical support. The knee and ankle are the joints to which this form of treatment is generally applicable. The knee-joint should never be resected in children.

e. Transplantation of Tendons.—This method of treatment is—in selected cases—one of the most successful for correcting and preventing deformities. The method adopted is to insert a slip from the tendon of a healthy muscle into the tendon or insertion of the paralyzed muscle. The use of silk ligaments for the correction of deformity and replacing

tendons has been strongly advocated, and good results have been published. For details of this mode of treatment, a surgical work should be consulted.

f. Amputation.—This has been advocated in cases in which there is complete paralysis of the whole leg, with arrested growth and with trophic sores.

It must be urged that, whatever method of treatment be adopted, it is essential to keep the limbs warm ; this is in part accomplished by loose woollen garments, stockings, and overalls, but superficial rubbing and passive movements of the limbs, twice or thrice a day, are of the greatest importance.

F. E. Batten.
(*Revised by Edwin Bramwell.*)

POLYPUS, NASAL.—(*See* NOSE, POLYPUS OF.)

POLYPUS, RECTAL.—(*See* RECTUM, SURGICAL DISEASES OF.)

POSTERIOR BASIC MENINGITIS.—(*See* MENINGITIS.)

POST-NASAL GROWTHS.—(*See* ADENOIDS.)

POTT'S DISEASE.—(*See* SPINE, CARIES OF.)

PREGNANCY, DISORDERS OF.

Vomiting.—If the vomiting is only slight and confined to the beginning of the day, breakfast in bed may be all that is required. If more severe, a careful search for the cause should always be made, as the vomiting is not necessarily due to the pregnancy. Oral sepsis is frequently found in cases of severe vomiting during pregnancy, and much good may be done by the use of antiseptic mouth-washes. In some cases the condition of the teeth and gums makes it necessary that a dentist should be called in. In other cases constipation is the cause of the vomiting. 'Pernicious vomiting' due to toxæmia is very rare in this country, and the induction of abortion on account of vomiting is seldom necessary. Albuminuria and rapidity of the pulse are two of the most important signs that the vomiting is toxæmic in origin. If treatment designed to combat the acidosis is not almost immediately successful, the uterus must be emptied. Conditions which have absolutely nothing to do with the pregnancy, such as gastric ulcer, appendicitis, and cerebral tumour, have been found in so-called cases of severe vomiting of pregnancy. If no cause for the vomiting can be found beyond the facts that the patient is pregnant, and, probably, that she is neurotic, the case should be treated on general principles, that is, by rest in bed, attention to the bowels, and careful feeding, if necessary only peptonized milk and soda-water being allowed at first. Suggestion often plays an important part in the treatment, and sometimes a threat that the stomach must be washed out, if the vomiting does not cease, acts like a charm. Seclusion and the services of a trained nurse are all-important in severe cases where the neurotic element is prominent. As regards drugs, alkalis given by mouth, and saline solution per rectum, are successful in many cases. An effervescing mixture containing bismuth and dilute hydrocyanic acid, cerium oxalate (10 gr. in cachet), chloretone (5 gr. every four hours or oftener), menthol ($\frac{1}{3}$ gr. with milk-sugar in cachet), and minim doses of tincture of iodine in a little water, are all useful remedies. Administration of potassium bromide per rectum is worth a trial.

If the vomiting persists in spite of this treatment, it is possible that twenty-four hours' rest to the stomach may be successful. During this time nothing is given by mouth except albumen-water, and possibly the effervescing mixture, saline enemata being administered if necessary. (*See also* ACIDOSIS, *and* SEA-SICKNESS.)

Salivation.—The treatment of this very unpleasant complication of pregnancy is most unsatisfactory, and the doctor often has to be content with pointing out to the patient that her health is not suffering, and with assuring her that the trouble will cease soon after labour. Large doses of alkalis sometimes diminish the amount of salivation. Belladonna and thyroid extract aa gr. $\frac{1}{4}$, bis die, may give relief. An astringent mouth-wash may relieve the discomfort temporarily. Restriction of the diet to milk is worth a trial.

Heartburn.—This is best treated by such a mixture as the following :—

℞	Sodii Bicarbonatis	gr. xx	Glycerini	℥xxx
	Spiritus Ammoniæ Aromatici	℥xx	Aquæ Anethi	q.s. ad ℥j

Or the following powder :—

℞ Sodii Bicarbonatis — Bismuthi Oxycarbonatis āā partes æq.
Magnesii Carbonatis Ponderosi

One teaspoonful to be taken occasionally.

Pruritus Vulvæ.—This may be very resistant to treatment. If any vaginal discharge is present, lukewarm douches of lead lotion (liq. plumbi subacetatis 1 drachm to the pint) should be given. Rest with the pelvis raised, to diminish the congestion, bathing with lead or other suitable lotion, e.g., calamine lotion or carbolic acid lotion $\frac{1}{80}$, dusting with dermatol, and avoidance of constipation are the best measures. (*See also* PRURITUS.)

Toothache.—The aching may be relieved temporarily by bicarbonate of soda taken into the mouth dry. A dentist should always be consulted, as caries may make very rapid progress during pregnancy. *H. Russell Andrews.*

PRESCRIBING.—Prescriptions are written directions (1) For the preparation, and (2) For the use of remedies.

The directions for the preparation of remedies are addressed to the dispenser, and are usually written in Latin. Those for the use of remedies are for the patient, and are usually written in English.

The directions for the dispenser consist of three parts, i.e., directions (*a*) to take ; (*b*) what to take ; (*c*) what to do with that which he has taken. Thus :—

Superscription. ℞ = Recipe = Take.
Inscription, or Designation of material. } Quantity of substance or substances.
Subscription. Mix, dissolve, etc.

The directions for the patient are called the 'Signature', and are sometimes preceded by the word 'Signe' or 'Signetur' = sign, or, let it be signed, and this is usually abbreviated to 'Sig.'

The quantity—ounces, drachms, etc.—is to be put in the accusative and after the substance itself, which is written in the genitive, e.g. :—

Take—of Rhubarb rhizome—1 oz., is rendered—
Recipe—Rhei rhizomæ—unciam unam.

The word 'misce' (mix) is the word which occurs most commonly in the subscription, and is usually abbreviated to 'M.'

The *model* prescription contains four parts :—

The Basis : the chief active ingredient.
The Adjuvant : aids the action of the basis.
The Corrective : counteracts any ill-effects of the basis or adjuvant.
The Vehicle : the diluent.

Of course many prescriptions do not contain all four parts.

Example :—

Superscription. Recipe.
Inscription { Magnesii Sulphatis uncias duas c̄ semisse (basis).
Extracti Glycyrrhizæ Liquidi drachmas quatuor (adjuvant).
Tincturæ Cardamomi Compositæ unciam unam (corrective).
Spiritus Ammoniæ Aromatici drachmas quatuor (corrective).
Infusum Sennæ ad uncias decem (adjuvant and vehicle).
Subscription. Misce.
Signature. One tablespoonful to be taken when required.

Written in the ordinary way the above prescription would be as follows :—

December 13th, 1914.

℞ Magnesii Sulphatis	℥iiss	Sp. Amm. Aromat.	℥iv
Ext. Glycyrrh. Liq.	℥iv	Inf. Sennæ	ad ℥x
Tinct. Card. Co.	℥j		

Misce. One tablespoonful to be taken when required.

Mrs. Jones. J. C.

The directions to the patient, usually written in English, may of course be written in Latin. But as the directions appear on the label of the bottle of medicine, when they are written in English on the prescription the patient has the opportunity of checking the dose with the dose on the label.

It is usual nowadays to prescribe *a single dose*, and to direct the dispenser to send an appropriate number of doses, as follows :—

December 13th, 1914.

℞	Ferri et Ammonii Citratis	gr. v	Spiritus Chloroformi		℥v
	Sodii Bicarbonatis	gr. x	Infusum Calumbæ	ad	℥j

Fiat mistura ter die sumenda.

Mitte ℥xij.

It is evident that by writing the prescription in this way the physician has escaped the labour of multiplying the dose of each ingredient by 12.

Written in the older way it would be as follows :—

December 13th, 1914.

℞	Ferri et Ammonii Citratis	℥j	Spiritus Chloroformi		℥j
	Sodii Bicarbonatis	℥ij	Infusum Calumbæ	ad	℥xij

Misce. Two tablespoonfuls three times a day.

INCOMPATIBILITY.

Unless the prescriber be content to recline entirely on his hospital pharmacopœia or on the tablets of the manufacturing chemist, he must know the elements of incompatibility. Now incompatibility can be a very large subject, one full of confusion and of never-ending exceptions ; but even in a short article it is possible to point out the very common examples which are constantly occurring in prescribing the common drugs.

1. *Carbonates and bicarbonates are decomposed by free acids.* This rule is of course well known to everybody, but it is often transgressed because the acid may not be quite in evidence.

Example :—

℞	Ammonii Carbonatis	gr. v	Aquam Destillatam	ad ℥j
	Syrupi Scillæ	℥xxx		

The Syrupus Scillæ is made from the Acetum Scillæ, and contains free acetic acid. The free acid, reacting with the Ammonium Carbonate, gives off CO_2, and leaves in the mixture Acetate of Ammonium, which is diaphoretic, not expectorant. The Tinctura Scillæ, not the Syrupus, should have been prescribed.

(It should be remembered that the Syrupus Limonis, a very common flavouring agent, contains a considerable quantity of free citric acid. The Tinctura Limonis, the Tinctura Aurantii, and the Syrupus Aurantii contain no free acid.)

The following prescription, found in many of the hospital pharmacopœias, is another example of the same kind :—

℞	Bismuthi Subnitratis	gr. x	Infusi Calumbæ	℥j
	Sodii Bicarbonatis	gr. x		

The oxycarbonate of bismuth is formed and CO_2 is given off. It is better to prescribe the carbonate of bismuth with the bicarbonate of soda.

(Acidum Hydrocyanicum Dilutum does not decompose carbonates or bicarbonates : it is often prescribed with bicarbonate of soda as a gastric sedative and antacid.)

2. *When solutions of two soluble salts are mixed and an insoluble compound can be formed by an interchange of radicles, this compound will, as a rule, be formed, and a precipitate will occur.*

The examples of incompatibility coming under this heading are very numerous, and can be avoided only by knowing which salts are insoluble.

Examples :—

(i)	℞	Magnesii Sulphatis	℥j	Aquæ Destillatæ	℥j
		Sodii Carbonatis	gr. x		

Carbonates, except those of the alkalis, are insoluble in water.

Therefore magnesium carbonate is precipitated. The bicarbonate of soda should be used ; it will not cause a precipitate. Magnesium Sulphate is not incompatible with

Ammonium Carbonate, e.g., they are both contained in the Mistura Sennæ Composita of the B.P.

(ii) ℞	Plumbi Acetatis	gr. v	Aquam Destillatam	ad ℥j
	Acidi Sulphurici Diluti	℥x		

Lead sulphate is precipitated.

(iii) ℞	Liquoris Bismuthi et Ammonii Citratis ℥xxx	Tincturæ Cardamomi Co.	℥xv
		Infusum Rhei	ad ℥j

Tannate of bismuth is precipitated. Preparations of rhubarb are frequently added to bismuth mixtures with the idea of counteracting the constipating effect.

3. *Salts of alkaloids* (omit caffeine).

a. Should not be prescribed in alkaline solutions, because the alkali seizes the acid and the alkaloid is set free, and, being only very sparingly soluble in water, it may be precipitated; e.g., Liquor Strychninæ Hydrochloridi 5 min. prescribed in 1 oz. of alkaline solution will probably not precipitate the alkaloid, because the amount of strychnine contained in 5 min. is soluble in 1 oz. of water; but if the dose of the Liquor be increased, or if the amount of the vehicle be diminished, precipitation will take place.

Examples :—

( ) ℞	Quininæ Sulphatis	gr. j	Spiritus Ammoniæ Aromatici	℥xv
	Acidi Sulphurici Diluti	℥j	Aquam Destillatam	ad ℥j

The quinine will, of course, be precipitated by the alkaline spiritus, which also contains Ammonium Carbonate, so that any free acid will cause effervescence.

(i) ℞	Ferri et Quininæ Citratis	gr. v	Aquam Destillatam	ad ℥j
	Spiritus Ammoniæ Aromatici	℥xv		

This is a combination often seen in prescriptions, probably due to the mistaken generalization that the scale preparations of iron—e.g., the Ferri et Ammonii Citras—are not precipitated by alkalis, but the *alkaloid* will be precipitated.

(The Tinctura Quininæ Ammoniata is a solution of Quinine Hydroxide in alcohol and in excess of ammonia. When water is added the alkaloid is precipitated. Therefore, in a mixture the tincture should always be prescribed with mucilage. Quinine precipitated in water is not so bitter as when in solution.)

Borax (biborate of sodium) is alkaline, and therefore precipitates alkaloids.

If the amount of alkaloid in a mixture be small, or if the alkali be weak, e.g., Sodii Bicarb., or Pot. Bicarb., no reaction may take place.

The bicarbonates and Ammonium Carbonate do not precipitate solutions containing atropine.

b. Iodides, bromides,* salicylates, benzoates, and tannates form insoluble salts with alkaloids, and therefore as a rule they are not prescribed together except in some formula which experience has shown to be satisfactory.

Examples :—

( ) ℞	Quininæ Sulphatis	gr. j	Potassii Iodidi	gr. v
	Acidi Sulphurici Diluti	℥j	Aquam Destillatam	ad ℥j

This is the Haustus Quininæ c̄ Pot. Iod. of the St. B. H. Pharmacopœia. On the face of it the prescription looks impossible, because of the presence of the alkaloid and of free acid with Potassium Iodide. But the mixture can be dispensed successfully in the following manner :—

Dissolve the quinine sulphate in the smallest possible amount of acid (¾ min. to each grain), so as to have the smallest possible amount of free acid present, then dilute the solution with half the vehicle.

The potassium iodide is dissolved in the other half of the vehicle, and, having thus diluted the two salts to the utmost, bring them together.

If excess of acid be used, or if the two salts be brought together in stronger solution, reaction will be inevitable.

---

* The hydrobromide of quinine is very soluble in water. Dilute hydrobromic acid is an excellent solvent of quinine salts, and tends to prevent the headache and singing in the ears which they may produce.

(ii)	℞ Quininæ Sulphatis	gr. j	Infusum Rosæ Acidum	ad ℥j
	Acidi Sulphurici Diluti	♏j		

Tannate of quinine is precipitated.

Only two infusions can be prescribed with alkaloids, viz., Infusum Calumbæ and Infusum Quassiæ, because they contain no tannin.

(iii)	℞ Quininæ Sulphatis	gr. j	Aquæ Chloroformi	℥j
	Sodii Salicylatis	gr. x		

Salicylate of quinine is precipitated. It is often prescribed in this way, and dispensed with a 'Shake the bottle' label. The prescription should contain Pulv. Tragacanthæ Co. gr. v, in order to suspend the precipitate.

Acetate of potash is often combined with quinine in a febrifuge mixture :—

(iv)	℞ Quininæ Sulphatis	gr. j	Potassii Acetatis	gr. x
	Acidi Sulphurici Diluti	♏j	Aquam Destillatam	ad ℥j

Acetate of quinine being insoluble is precipitated.

c. Double iodides are prompt precipitants of alkaloids. In most hospital pharmacopœias there is a Mistura Hydrarg. Perchlor. c. Pot Iod. This mixture by interaction contains a double iodide of mercury and potassium, and being somewhat depressant, Liq. Strychninæ Hydrochlor. has often been added to it, resulting of course in a precipitate of iodide of strychnine. Donovan's solution—Liq. Arsenii et Hydrarg. Iodi—readily precipitates alkaloids.

(Mercuric Chloride alone will precipitate most alkaloids—indeed the drug is incompatible with so many things that it should never be prescribed except in some formula which experience has shown to be satisfactory.)

4. *Iron salts.*

a. Not generally prescribed with anything containing tannin ; the tannate of iron is ink. The preparations of Calumba and Quassia do not contain tannin.

Example :—

℞	Ferri et Quininæ Citratis	gr. v	Spiritus Chloroformi	♏x
	Liquoris Strychninæ Hydrochloridi	♏iv	Aquam Destillatam	ad ℥j
	Tincturæ Cardamomi Co.	♏xxx		

The tannin in the compound tincture will tend to precipitate the iron and quinine and strychnine. Tinct. Calumbæ ♏xxx would be compatible.

The preparations of digitalis are sometimes said to be incompatible with iron salts, as they contain a little tannin, but the incompatibility may be neglected.

Example :—

℞	Liquoris Ferri Perchloridi	♏x	Aquam Chloroformi	ad ℥j
	Tincturæ Digitalis	♏x		

No doubt a little tannate of iron will be precipitated—but it is not important. (The addition of Acid. Phosph. Dil. ♏x will make the mixture clear—for the tannate of iron is substituted the phosphate of iron soluble in the excess of phosphoric acid and of the free hydrochloric acid of the Liquor.)

b. The ordinary iron preparations, e.g., Liq. Ferri Perchlor., or Tinct. Ferri Perchlor., are precipitated by alkalis. Ferri et Ammon. Cit. and Ferrum Tartaratum are not precipitated by alkalis.

Examples :—

(i)	℞ Liquoris Ferri Perchloridi	♏x	Infusum Quassiæ	ad ℥j
	Sodii Bicarbonatis	gr. xv		

This will throw down a hydrate of iron.

(ii)	℞ Ferri et Ammonii Citratis	gr. v	Infusi Quassiæ	℥j
	℞ Sodii Bicarbonatis	gr. xv		

This will not precipitate.

5. *Liq. Arsenicalis, being alkaline*, should be prescribed with Ferri et Ammon. Cit. or Ferrum Tartaratum. *Liq. Arsenici Hydrochlor., being acid*, should be prescribed with the ordinary iron preparations, e.g., the Liq. Ferri Perchlor. or Tinct. Ferri Perchlor. It was put into the B.P. for the purpose.

Example :—

℞	Liquoris Arsenicalis	℥iv	Spiritus Ammoniæ Aromatici	℥x
	Ferri et Ammonii Citratis	gr. v	Aquam Destillatam	ad ℨj

However, we often see prescriptions such as this :—

℞	Liquoris Arsenicalis	℥iv	Spiritus Chloroformi	℥xv
	Liquoris Ferri Perchloridi	℥x	Aquam Destillatam	ad ℨj

Theoretically, the alkaline Liq. Arsenicalis should precipitate the iron, but no precipitate takes place, because the iron solution contains so much free acid that the resultant mixture is still *acid.*

Evidently also the acid solution of arsenic should be chosen to combine with alkaloids, for example, with strychnine or with quinine, or with the cinchona preparations.

Example :—

℞	Liquoris Arsenici Hydrochlorici	℥iv	Tincturæ Ferri Perchloridi	℥x
	Liquoris Strychninæ Hydrochloridi	℥iv	Infusum Quassiæ	ad ℨj

People have died from the prescription of Liq. Arsenicalis with Liq. Strychninæ Hydrochlor., the alkali precipitating the alkaloid to the bottom of the bottle, so that the patient has taken the whole of the poison in one dose.

Again, the acid solution should be used with Liq. Hydrarg. Perchlor., because the alkaline solution will throw down mercuric oxide.

Liq. Arsenicalis, however, is sometimes added to a Mistura Hydrarg. Perchlor. c Pot. Iod. to prevent the appearance of iodism, but this mixture really contains a double *iodide* of mercury and potassium, with which alkalis and not acids are properly prescribed (*see Iodides*).

Liq. Sodii Arsenatis is generally alkaline, and therefore tends to precipitate alkaloids or ordinary iron salts, whilst Donovan's solution, Liq. Arsenii et Hydrargyri Iodidi, is, of course, a typical precipitant of alkaloids (see *Alkaloids*).

6. *Iodides and Bromides* should be given in neutral or alkaline solutions—most acid solutions tend to set free iodine or bromine—therefore they are compatible with Ferri et Ammon. Cit. or Ferrum Tartaratum, and incompatible with Liq. Ferri Perchlor. or Tinct. Ferri Perchlor.

Caffeine Citrate and Bismuth Subnitrate both give acid solutions in water, and are therefore incompatible with iodides and bromides.

Example :—

℞	Bismuthi Subnitratis	gr. x	Aquæ Destillatæ	ℨj
	Potassii Iodidi	gr. v		

Iodine is set free, and in a few minutes the mixture becomes yellow from formation of Iodide of Bismuth. Bismuth *Carbonate* will go well with iodides.

Iodides are often prescribed with nitrites, e.g., Spiritus Ætheris Nitrosi. Nitrites tend to decompose in water, with formation of nitrous acid. Thus nitrites may become incompatible with iodides. It is usual in dispensaries to keep a few crystals of Potassium Bicarbonate in the Spiritus Ætheris Nitrosi bottle to neutralize any acid formed.

Iodides with alkaloids (see *Salts of Alkaloids*).

7. *Sodium salicylate.*

a. This cannot be prescribed in acid solutions, because any acid will turn out the weak salicylic acid, which, being insoluble, may be precipitated. The same applies to benzoates.

Example :

℞	Sodii Salicylatis	gr. x	Aquam Distillatam	ad ℨj
	Syrupi Limonis	ℨj		

The Syrupus Limonis contains much free citric acid; therefore Sodium Citrate will be formed and Salicylic Acid thrown down.

Sodium Salicylate should be prescribed with Caffeine itself, not with Caffeine Citrate, because the Citrate easily dissociates in water and citric acid is set free.

b. Sodium Salicylate is often prescribed with Iron. Rheumatic fever rapidly causes anæmia. Ferri et Ammon. Cit. or Ferrum Tartaratum should be chosen, because the Liquor (or Tincture) Ferri Perchlor. will give a deep purple coloration, or even precipitate.

Example :—

℞	Sodii Salicylatis	gr. x	Glycerini		℥xxx
	Ferri et Ammonii Citratis	gr. v	Aquam Destillatam		ad ℥j

The mixture may turn somewhat redder in colour, but there will be no precipitate.

c. Acetylsalicylic acid (aspirin) is very sparingly soluble in water, and as it dissociates in water it is best prescribed in the form of a tablet or cachet. It is swiftly split up by an alkali, and should not be prescribed in alkaline solution. Prescribed with sodium bicarbonate, as it so often is, the mixture contains sodium salicylate, not acetylsalicylic acid.

8. *Chloral hydrate* prescribed with alkalis splits up, with formation of chloroform.

Example :—

℞	Chloral Hydratis	gr. x	Aquæ Destillatæ		℥j
	Ammonii Carbonatis	gr. v			

9. *Hexamine* (urotropine) is a compound derived from ammonia and formaldehyde. It is not in itself antiseptic, but in a solution sufficiently acid it is split up and the formaldehyde set free. Hexamine is said to be antiseptic only in acid solution.

The commonest use of the drug is as a urinary disinfectant, and for this purpose it is often prescribed with Potassium Citrate—a combination which seems unfortunate, because the Potassium Citrate, excreted in the urine as a carbonate, renders the urine less acid, or even alkaline, and thus tends to hinder or prevent the setting free of formaldehyde. In cases where the urine is alkaline, neutral, or faintly acid, it would seem more reasonable to prescribe hexamine with Acid Sodium Phosphate, the drug most successful in increasing the acidity of urine, or—as some prefer—to precede the exhibition of hexamine by a course of Acid Sodium Phosphate until the urine is sufficiently acid. *James Calvert.*

PRIAPISM may occur (1) As the result of injury to the spinal cord; (2) In association with prostatic enlargement; (3) In the course of leukæmia (probably from thrombosis in the cavernous sinuses); (4) As a local manifestation of gout.

In addition to treatment of the primary condition, the following may be useful :—

℞	Pulveris Camphoræ	gr. xvj	Tincturæ Lupulinæ		℥ij
	Tincturæ Belladonnæ	℥l			

Misce et adde :—

Mucilaginis Tragacanthæ	℥iv	Aquam Camphoræ	ad ℥iv

℥ss an hour after breakfast and at bedtime for three or four days.

Bromides in 30-gr. doses at bedtime are effective in some cases, but in others all medicines and even deep narcosis are of no effect.

Locally, cold applications are helpful, or the patient may be instructed to place some cotton-wool beneath the foreskin at bedtime, and on waking inject into this a few drops of a 10 per cent solution of cocaine by means of a pen-filler. This will sometimes effectually control the condition. In some, however, the operation of incising one or both of the corpora cavernosa is the only way of giving relief. *Robert Hutchison.*

PROCIDENTIA.—(*See* RECTUM, SURGICAL DISEASES OF.)

PROCTITIS.

Acute Catarrhal Proctitis.—Rest in bed is essential until all the symptoms have disappeared. The bowel should be thoroughly washed out with a saline laxative, and afterwards irrigation of the bowel with hot or cold water is often most comforting. Suppositories of iodoform and opium, or an ounce of flax tea containing ½ gr. of opium and 30 minims fluid extract of krameria, will allay the tenesmus and spasm at once. The diet must be regulated so as to leave as little residue as possible, but it is better to avoid the use of milk. After the acute stage is passed, irrigation of the bowel with 1 per cent of argyrol or argonin will hasten convalescence, especially if combined with strychnine and iron by the mouth.

Gonorrhœal Proctitis.—The rectum should be irrigated frequently with weak potassium permanganate or normal saline solution through a two-way irrigator tube, or, failing

this, two tubes passed into the rectum, one, of smaller calibre than the other, being used for the ingoing fluid. If a very acute case, continuous irrigation for some hours can be arranged. The bowels should be kept loose with petroleum and magnesia by mouth, and at night an injection of starch and opium or oil and chloretone, into the rectum, will be found very useful.

Chronic Proctitis.—A very good plan is to start the treatment with large rectal injections of warm olive oil, which should be retained as long as possible. After this, irrigation of the bowel twice daily with 1–2000 potassium permanganate or 1 per cent argonin is useful if it can be properly carried out. Careful regulation of the diet to prevent intestinal fermentation, combined with a daily dose of sulphate of magnesia or Carlsbad salts, is also indicated. Full doses of arsenic are beneficial, and in many cases an intestinal antiseptic is useful. Injections of silver nitrate into the bowel, starting with 2 gr. to the ounce and working up to 15 gr., are often very effectual; they must not, however, be continued for long, as a considerable quantity of the silver is absorbed and may stain the skin. Protargol injections are also useful, starting with a 1 per cent solution and going up to about 3 per cent. A very valuable method of treatment in these cases is by electric ionization. In fact, so satisfactory has this treatment proved, that it has now almost replaced the use of irrigation in those cases where it can be applied. It requires, however, proper apparatus, and some person skilled in the administration of drugs by this method. The treatment is carried out as follows: A special electrode, having a bag made of animal membrane surrounding it, is introduced into the rectum, and the bag is then distended with a 2 per cent solution of zinc sulphate; a current of about 6 to 10 milliampères is then passed for about twenty minutes, the other pole being applied to the back or abdomen. Treatments are given every four or five days for three or four times; after this at intervals of a fortnight or three weeks. *J. P. Lockhart-Mummery*

PROLAPSUS ANI AND RECTI.—(*See* Rectum, Surgical Diseases of.)

PROSTATE, ENLARGEMENT OF.—Setting aside chronic inflammatory enlargements of the prostate, which are met with at any age, obstruction to micturition and the secondary changes caused by it in the urinary system are seldom encountered before the sixth decade of life. Enlargement of the prostate is commonly called hypertrophy of that organ, but in examination of a large number of specimens the writer has not come across a single instance of true hypertrophy—i.e., a general enlargement of the organ in which each several element—glandular, connective tissue, and vascular—was enlarged in its right proportion to the whole. On the contrary, the enlargement is due either to an abnormal increase of the epithelial or the connective-tissue portions of the gland in the one case or the other, and it must be remembered that this increase may be either of an innocent or a malignant character.

Treatment.—The treatment of enlargement of the prostate must be considered separately for each variety.

Carcinoma in the great majority of cases can be treated only palliatively. Careful aseptic catheterism should be instituted and persevered with until the pain or hæmorrhage caused by it becomes severe, or the difficulty of catheterism becomes too great. At this point a carefully performed suprapubic drainage should be done. If great attention is paid to the fitting of the suprapubic tube very little leakage occurs, and the patient is able to get about in fair comfort. Perineal drainage should never be undertaken for carcinoma of the prostate.

It is only quite recently that a serious and sustained attempt has been made to remove the growth. No mere enucleation will serve, but the prostate and the whole lower portion of the bladder up to the inter-ureteric bar, together with the seminal vesicles, must be excised. Sufficient time has not yet elapsed to speak with certainty as to the radical nature of this operation, but the results are not very encouraging.

Fortunately, in a large number of cases the growth does not tend to encroach very much upon the urethra or cavity of the bladder, and catheterism remains fairly easy up to the end. In a few cases of apparent malignant disease of the prostate, of so large a size and so advanced a nature that an operation for removal could not be contemplated, radium has recently been tried with some apparent success.

Sarcoma of the prostate is rare, but is seen occasionally. It usually occurs in young subjects, and a considerable proportion of the cases have been in children. Operation is dangerous and useless. Radium may be tried, but the prospect of success is very slight.

Fibrous Enlargement.—Palliative treatment consists in careful catheterism; but these prostates are particularly well suited to complete cure by operation, and without much danger. The operation of enucleation, so successful in adenoma of the prostate, is neither easy nor very satisfactory in these cases. Piecemeal excision, or prostatotomy by the perineal route, are the two operations which give the best results. In the former the posterior aspect of the prostate is freely exposed by careful dissection, and the gland recovered from its sheath by scissors and forceps and a blunt dissector. Prostatotomy should be done through a median perineal incision, the urethra being opened well in front of the compressor urethræ muscle, and the prostate incised from within in any desired direction. Great care must be taken to leave the compressor urethræ intact, or the patient will be incontinent. The operation may be performed through a suprapubic incision, the cuts in the prostatic urethra being made from within the bladder, but the former operation is much more satisfactory.

Adenoma.—The most common enlargement of the prostate is the adenomatous type, which formerly went by the name of ' senile hypertrophy of the prostate '.

When the enlargement causes obstruction to the flow of urine, there are two alternative methods of treatment, palliative and radical. Palliative treatment consists in the regular use of the catheter, radical treatment in prostatectomy. Although the general trend at the present time is to advise prostatectomy in nearly every case, we must not lose sight of the fact that by regular use of the catheter numerous patients have lived for many years in comfort, and ultimately died from some other disease. Success depends on careful management of the patient. If he can be persuaded to avoid the more important causes of prostatic congestion, such as constipation, and over-indulgence in food and alcohol, and if he will take an adequate amount of walking exercise, and will give the necessary time and take the necessary trouble which the careful toilet of the catheter demands, he may live for many years in comfort and in excellent health. If the urine becomes cloudy at any time he should report it at once, and, if it is due to cystitis, appropriate treatment will quickly cure the condition. It is of the first importance that his introduction to catheter life should be treated as a serious matter. If he first comes under observation during an attack of retention, not more than twenty ounces should be drawn off at one sitting, and if the bladder is not emptied then, the catheter must be passed every four hours, and the same amount drawn off until it is emptied. For the first two or three days he should be confined to bed, as exposure to chill is dangerous and may prove fatal. Hexamine should be given for a time in 10-gr. doses every six hours.

The disadvantages of catheterism are, in the first place, the care and time the patient must devote to sterilizing and passing the catheter, and the necessary discipline to which he must submit. To many this is so tedious and irksome that they at once decide that operation and its attendant risks are infinitely preferable. Secondly, there is the danger of such complications as cystitis, epididymitis, and catheter stricture.

With regard to the mortality of prostatectomy, 438 cases were operated upon at St. Peter's Hospital in the four years 1916–19. Of these. 31 died, representing a mortality of a little more than 7 per cent.

There are, of course, some who are unfitted for the operation by an intercurrent disease of the cardiovascular and respiratory systems, or by their very feeble health. On the other hand, if the patient's surroundings are such that early sepsis may be confidently predicted, operation should be undertaken if his general condition permits.

Further, if catheterization is difficult, or if the patient does not adhere to his instructions, and has one or more attacks of cystitis, or if he finds catheter life very irksome and trying, the question of operation must be reconsidered.

Severe hæmorrhage should be treated by operation. The bladder should be opened and all blood and blood-clots evacuated, the surface of the prostate being examined for bleeding points, which should be touched with the actual cautery. The bladder should be drained by a large tube. In all probability the patient will be fit for removal of the prostate a week or ten days later.

Prostatectomy may be performed by the suprapubic or perineal route. The latter

operation is more frequently practised on the Continent and in America than in England. Suprapubic prostatectomy is the easier of the two. The perineal operation is more frequently followed by epididymitis and certain sequelæ, such as urinary fistula and stricture.

The causes of death after prostatectomy are renal failure, sepsis, hæmorrhage and shock, and embolism. Renal failure may be avoided by a careful preliminary estimation of the efficiency of the kidneys, as shown by the specific gravity, urea excretion, and the result of colour tests, coupled with the general signs of renal failure, such as thirst, headache, and the state of the tongue. In these cases preliminary drainage of the bladder, either by catheter or through a suprapubic incision, will often enable the kidneys to recover to such an extent that an operation which would have been fatal is attended by a brilliantly successful result.

Sepsis can be controlled by urinary antiseptics, preliminary drainage and irrigation of the bladder, and continuous irrigation after the operation. Severe hæmorrhage which cannot be checked by irrigation with hot water, or hot silver nitrate solution in a strength of 1–15,000, can be controlled by packing the prostatic cavity with gauze ; but better still, by opening the bladder freely and exposing the prostatic cavity, as recently suggested by Thomson Walker ; the bleeding points can then be crushed by strong forceps or secured by catgut ligatures. Shock can be limited by employing spinal anæsthesia. If the patient is nervous, light general anæsthesia by means of gas and oxygen is a valuable addition, unless it is contra-indicated for any reason. In most cases, however, shock is largely due to hæmorrhage. Death from embolism is one of the tragedies of surgery, and usually occurs from seven to fourteen days after the operation. Prophylactic treatment consists in limiting hæmorrhage as far as possible during and after the operation, maintaining an adequate circulation, and reducing sepsis to a minimum. *John George Pardoe.*
(Revised by Hugh Lett.)

PROSTATITIS.—(*See* GONORRHŒA.)

PRURITUS.—Before deciding on the treatment, it is necessary to determine whether the case is one of primary or secondary pruritus. No case can be regarded as a true primary pruritus until all skin diseases to which it might be secondary, and all possible causes of external irritation, have been eliminated. If after very careful examination no such causes can be found, inquiries must be made as to how far the patient's mode of life transgresses the usual hygienic principles, and whether there is any evidence of diabetes, gout, or intestinal disease, as shown by investigation of the urine and blood and by general physical examination. Any circumstances which might predispose to, or determine the onset of, pruritus must be inquired into, and the patient's diet and mode of life regulated accordingly. In almost every case alcohol, tea, and coffee must be forbidden, as also rich and highly-seasoned dishes. Some patients find their symptoms are improved by a vegetarian diet with plenty of milk, or, in default of this, they should live chiefly on poultry, green vegetables, and milk puddings, with plenty of Salutaris or slightly alkaline mineral waters. Rest and absence of worry have a favourable effect on neurotic patients, and it is often wonderful how much good a few weeks in bed or in a nursing-home will do. Some pruritics are benefited by a change to the country or the mountains, or to a spa like Royat or Aix-les-Bains.

Internal Treatment should begin by giving preparations of salicylic acid ; salol, sodium salicylate, or salophen may be given alone, or in combination with phenazone, acetanilide, or phenacetin. Carbolic acid in pill form is successful in some cases ; arsenic and atropine may be tried, and pilocarpine (10 to 20 drops of a 1 per cent solution) occasionally gives good results. But greater success is usually obtained with sedatives, especially bromide of sodium in combination with 5 min. of cannabis indica, or tincture of aconite with 10 min. of tincture of gelsemium, repeated at short intervals. Temporary relief from irritation may sometimes be obtained by small doses of aspirin, antipyrin, or phenacetin. In more severe cases where insomnia is a marked symptom, hypnotics are necessary : sulphonal, methylsulphonal, chloral hydrate, or medinal.

External Treatment must always be employed in addition to internal remedies, and one of the simplest and most effectual applications is an evaporating lotion. Equal quantities of eau de Cologne and water applied on lint, which is kept moist with the liquid, or

lavender water dabbed on every few minutes, often affords great relief, especially if preceded by hot applications. Sponging with water as hot as can be borne, with or without the addition of bicarbonate of soda, or a hot bath, or better still a vapour or Turkish bath, causes dilatation of the capillaries of the skin ; and the subsequent constriction of these vessels brought about by cooling or evaporating lotions is not only more complete, but also induces a more lasting cessation of the itching. The addition of oatmeal to a hot bath is usually beneficial, or, still better, half a pound of gelatin made into a jelly with warm water and then added to the bath, or one pound of starch worked into a smooth paste with cold water and boiled, or half to one pound of linseed. Alkaline baths often give relief in the milder cases, and they are easily made by adding 2 or 3 oz. of either sodium carbonate, bicarbonate, or borate to a bath of 30 gallons of water. The patient soaks in the bath for about twenty minutes, dries himself with a soft towel, and then rubs in a weak cocaine ointment, containing 1 gr. to the ounce of soft paraffin. Creasote and sulphurated potash are somewhat objectionable to sensitive patients, but the sulphaqua powders are a convenient method of making a not unpleasant sulphur bath. A combination bath of sulphur and pine-oil is obtained by dissolving piutinol in the bath, and it gives good results. Of cooling lotions, the simplest is one containing 2 drachms of liquor plumbi subacetatis to 1 oz. of lavender water and 7 oz. of distilled water. A lotion containing hydrocyanic acid which is very successful is the following :—

℞	Acidi Hydrocyanici Diluti	℥iss	Glycerini	℥ss
	Spiritus Rosmarini	℥j	Aquam	ad ℥x

Carbolic acid made up in the strength of 1 drachm to 10 oz. of water, with the addition of ½ oz. glycerin and ½ oz. eau de Cologne, gives a useful lotion ; if necessary, to any of these lotions 1 drachm of cocaine may be added to give a greater antipruritic effect.

The best way to apply them is to soak a single layer of lint or linen with the lotion, lay it lightly on the itching surface with no covering over it, and sprinkle or spray on fresh lotion every five minutes so as to keep the lint thoroughly moist.

Alkaline lotions consisting of either 2 drachms bicarbonate of soda, 2 drachms carbonate of potash, or 1 drachm borax, to 8 oz. water are all useful for cases where large areas of skin are involved, and the addition of a little menthol will increase the effect.

The following lotion often gives relief, and may be used for weeks without harmful effects :—

℞	Ichthyolis	℥ss	Spiritus Lavandulæ	℥ss
	Sodii Bicarbonatis	℥iss	Aquam	ad ℥viij

In very severe and intractable cases the withdrawal of about 5 min. of cerebrospinal fluid by lumbar puncture sometimes gives immediate relief.

For general pruritus, ointments, sprays, paints, and varnishes are rarely suitable, but they all find their uses in the following localized forms of pruritus.

In *pruritus genitalium*, and especially pruritus of the vulva, the hygienic and dietetic rules already discussed in detail must be adhered to. In the more usual cases of *pruritus vulvæ* (q.v.), where there is a uterine or vaginal discharge, strict cleanliness must be enjoined, with a plentiful use of soap and water, and douches of 1–5000 potassium permanganate, 1–5000 perchloride, or 1–1000 zinc sulphate. After this a vaginal tampon must be inserted and the external parts covered with Lassar's paste containing 1 per cent silver nitrate or lenigallol. An ichthyol ointment or paste may be substituted, or an ointment containing 30 min. of chloroform to 2 oz. of lard, or the ordinary aconitine ointment. An ointment which often gives good results is the following : chloral hydrate, menthol, and camphor, each 45 gr., lanolin and vaseline, each ½ oz. If there is any induration of the skin in the pruritic area, a dressing of Lassar's paste containing a small percentage of salicylic acid must be applied continuously until this has been got rid of or has diminished in amount, and any excoriations present have healed. An ointment containing liquor carbonis detergens ½ drachm, unguentum conii 1 oz., will then relieve the itching, or the following ointment :—

℞	Creasoti	℥j	Hydrargyri Subchloridi	℥ss
	Tincturæ Aconiti	♏iij	Olei Rosmarini	♏x
	Zinci Oxidi	℥ss	Vaselini Albæ	℥j

These ointments may be alternated with the following :—

℞	Chloral Hydratis Camphoræ	āā ℥ss	Cerati Simplicis	℥j
℞	Chloroformi Olei Lavandulæ	℥ss ♏x	Adipis Benzoati	℥j

These ointments are best used at night, bathed off in the morning with some olive oil, and the following powder applied : chloral hydrate and cocaine, each 40 gr., powdered starch, 1 oz.

The advantage of using an ointment is, that the parts are protected from the action of any discharge which, in spite of the tampon, comes in contact with them. In my experience, fluid solutions of menthol or carbolic acid usually cause intense smarting and soreness in these cases, as do also many spirit applications.

The addition of cocaine in the strength of 5 per cent is often advantageous, and may be combined with oil of cade or anthrasol in the form of an ointment. The more inveterate cases respond well to applications of a Paquelin cautery, to excision of kraurotic skin areas, or to turning up a flap of skin all round the vulva and division of the afferent nerve fibres. In cases of diabetes, the patient must be strictly dieted, and, if the urine cannot be always drawn off with a catheter, the vulva should be covered with some protective sedative dressing in the form of an ointment or soluble varnish. One of the best of these latter is ung. casein, with the addition of 2 per cent ichthyol or 1 per cent tar. Casein ointment is composed of alkali caseinate, glycerin, vaseline, and water, and forms a thick white emulsion which dries on the skin in a minute or two, forming an elastic dry covering, readily washed off. On the one hand it is porous enough to permit of evaporation, on the other it can be combined with fat, which helps the added ichthyol or tar to make its way deeply into the tissues. It is therefore more than a protective varnish, and holds a position intermediate between the ointments on the one hand and the pastes and powders on the other. Methylene blue given in pill form, 1 gr. night and morning, with a paint of methylene blue, 4 gr. to the ounce, applied at frequent intervals, has the objection that it stains the urine blue, but if this does not contain sugar the treatment is often successful. A paint which is frequently used is a 2 to 3 per cent solution of silver nitrate in sweet spirits of nitre.

A vaccine of *B. coli* or streptococci is sometimes successful, especially in pruritus ani.

When there is marked insomnia, especially in the aged, where the skin is naturally dry and the itching at night often intense, it is frequently necessary to order suppositories of cocaine, morphia, or medinal. It must be remembered that many patients scratch quite unconsciously during their sleep until the cutaneous nerves have been numbed by the vasomotor dilatation and resulting exudation ; and this in spite of any dressings, unless these are fixed so tightly as to be uncomfortable. Such scratching may undo the whole benefit of treatment applied during the day, and leave an excoriated and inflamed surface which takes some time to heal up. In such cases suppositories are of the greatest service, but they must be looked upon merely as a temporary means of relief, and be discontinued as soon as possible.

In the most obstinate cases, a rapid application of the actual cautery to the most irritating areas often causes great amelioration of the symptoms. Or, the area may be painted with pure carbolic acid. Either method causes denudation of the part, which can readily be healed up by application of a zinc paste. The high-frequency current applied with a glass electrode is occasionally successful, and cases frequently react well to two or three half-pastille doses of x rays at intervals of ten days. The action of x rays in pruritus is not easy to explain, but I have seen cases cured, at least for a time, by this means, which had resisted all other treatment. A radium plaque application to small areas is at times a convenient and satisfactory method of treatment.

The pruritus which is brought on by baths can be diminished by regulating the temperature of the bath, and by avoiding the use of any but superfatted soaps, employing even these but sparingly. The patient must not stay in the bath for more than a few minutes, and the bathroom must be warmed to 70°, so that the change of temperature on leaving the bath shall not be too great. After drying, a very weak carbolic ointment should be rubbed lightly into any itching skin areas, and a dusting powder of vasenol

applied freely. In these cases the skin is as a rule rather dry and harsh, and the use of greasy applications is to be recommended in preference to lotions. In very susceptible patients, the addition to the bath of half a pound of starch stirred into a paste with cold water will often diminish or prevent any pruritic after-effects. Attention must be paid to the underwear; silk or linen garments should be worn next the skin, and woollen undergarments strictly forbidden. Internal treatment does not appear to have much effect in these cases.

In *pruritus hiemalis*, or winter itch, the best results can be obtained by wintering in a warm climate, such as Egypt or Algiers. Failing this, the rooms and corridors should be heated by radiators, and all sudden changes of temperature avoided. A simple cream of zinc oxide, lime-water, and olive oil, containing 1 per cent of menthol or ½ per cent of cocaine, should be rubbed in night and morning. Alcohol in all forms, and also strong coffee, must be forbidden.

The treatment of the itching which is a common symptom of many skin affections is primarily and essentially that of the accompanying skin disease. *J. L. Bunch.*

PRURITUS ANI.—The treatment of pruritus ani is both difficult and tedious, and the results are unfortunately often far from satisfactory. One of the most important factors is to make a very careful examination of the anus and rectum. If there is a local cause for the itching—and there usually is—and it is not discovered, the treatment is more than likely to fail completely.

If a fissure, polypi, or piles exist, they must be treated by operation. External skin tags—often called external piles—may cause itching, owing to dirt and secretion being retained in the folds between them; little sores are thus formed which keep up the irritation. These skin tags should be cut off.

When the pruritus is due to proctitis, this must be first treated by daily irrigations, etc. (*see* PROCTITIS). If the external skin is red and eczematous, applications should be applied to restore its normal condition. For this purpose lead lotion, liquor carbonis detergens, or resorcin ointment 10 gr. to the ounce, is useful. Patients suffering from pruritus should keep the anal region scrupulously clean. The parts should be washed twice a day, and after an action of the bowels, with Castile soap and warm water applied with a soft sponge. The parts should then be dabbed dry and powdered with boracic powder. A little orthoform powder blown on to the parts with an insufflator is effectual in some cases.

When there is much thickening of the skin round the anus, fomentations of carbolic lotion 1–60, applied every night for a week, will often rapidly bring the skin back to its normal condition; or the skin can be painted over with silver nitrate solution 30 gr. to the ounce every day.

The following ointments will be found to give relief in many cases:—

℞	Hydrargyri Subchloridi	ʒij	Glycerini	ʒij
	Bismuthi Subnitratis	ʒiss	Unguenti Sambuci	q.s. ad ℥j
	Tincturæ Aconiti	℥vij		
℞	Balsami Peruviani		Vaselini	q.s. ad ℥j
	Acidi Borici	āā ʒj		

In some patients lotions are more effectual:—

℞	Liquoris Plumbi Subacetatis	ʒj	Lactis (nov.)	q.s. ad ℥j
℞	Campho-phenique	ʒj	Aquæ Destillatæ	q.s. ad ℥j

This should be applied after washing the parts with hot water.

In bad cases of pruritus an anæsthetic should be given and the sphincter stretched. The anal canal and rectum should then be thoroughly explored, and any local condition, such as an ulcer or submucous fistula, be treated. It cannot be too strongly insisted upon that there is almost always a local cause for the itching; in some persons, however, diet has much to do with it, and in such cases must be regulated, alcohol, tea, and coffee being interdicted. Very good results have recently been obtained by the author with iodine applications (2 per cent), this drug being driven into the skin by cataphoresis. Mr. Dwight Murray, of the United States, has recently published several papers to show that

pruritus ani is in many cases due to infection of the anal skin with the *Streptococcus fæcalis* : and he publishes reports to prove that good results can in these cases be obtained by vaccines prepared from the patient's own cultures, and sometimes even from the use of stock vaccines prepared from streptococci. (*Proc. Amer. Proct. Soc.*, 1912.)

Lastly, in those cases of old intractable pruritus where all forms of treatment have failed and the patient's life is rendered miserable by the constant irritation, Ball's operation is the best treatment. This is similar in principle to the operations for 'tic douloureux', and consists in dissecting up flaps on each side of the anus, and dividing all the cutaneous nerves to the affected area. This operation stops the itching at once, and the results appear to be permanent in most cases. The author has had excellent results in bad cases from this operation, and believes it to be indicated in such cases when other measures have failed to give relief. Exposing the parts to the action of the *x* rays has given excellent results in some of these cases, and is well worth a trial. Great care, however, must be exercised to avoid burning the patient ; a pastille dose of the *x* rays is the correct dosage—repeated in fourteen days. *J. P. Lockhart-Mummery.*

PRURITUS VULVÆ.—The first thing to do is to search for and, if possible, remove the cause of the pruritus. The urine should be tested, and if it is found to contain sugar, antidiabetic treatment should be given. Any vaginal discharge should be treated. Imperfect local cleanliness may be the cause, sebaceous matter being retained in the folds of the vulva. In fat women, especially in hot weather, intertrigo may occur, and cause itching. Threadworms coming out from the anus are occasionally the cause of intolerable itching. Pediculi pubis *may* be the cause of pruritus, but probably only when their presence is accidental rather than habitual. External piles and constipation must be treated. Pruritus vulvæ may occur during pregnancy (*see* PREGNANCY, DISORDERS OF).

It must be remembered that pruritus is often the only symptom complained of by a patient who is suffering from carcinoma of the vulva. Leukoplakia of the vulva, often a cause of pruritus, may be looked on as a precancerous condition, and should be treated by excision of the vulva.

If no cause can be found, the treatment consists in cleanliness, bathing with lotio plumbi (liq. plumbi subacetatis, 1 drachm to the pint), liq. carbonis detergens (2 drachms to the pint), a lotion of carbolic acid (1–60 or 1–80), or lotion of calamine, and powdering with dermatol. Menthol used locally is sometimes effective. Cocaine is unsatisfactory as a rule. If these measures fail, cauterization or even excision of the itching skin and mucous membrane may have to be considered.

In cases where the scratching has caused a raw eczematous surface, an ointment of zinc oxide or subacetate of lead should be used. (*See also* DIABETES and PRURITUS.)

H. Russell Andrews.

PSILOSIS.—(*See* SPRUE.)

PSOAS ABSCESS.—(*See* SPINE, CARIES OF.)

PSORIASIS.

Internal Treatment.—Of the many internal remedies which have been at one time or another recommended, only a few have stood the test of time. Of these the most popular is arsenic, which in suitable cases is of undoubted value. If the disease is recent, and if the spots are increasing in number, and are deep red in colour, it should not be given, as it will almost inevitably aggravate the disease ; if, on the other hand, the disease has begun to retrograde, if the spots are pale pink in colour, and, most important, if the patient's digestive functions are in good order, small doses of arsenic will hasten its disappearance. The disadvantages attendant on its use must not be forgotten ; the least of these is the deep pigmentation of each spot ; more serious is the development of peripheral neuritis ; and most serious of all is the occasional development of malignant growths. The cacodylates and other organic preparations have been recommended in its place, but experience seems to show that their action is essentially that of arsenic, and that they are no more efficient (*see under* PEMPHIGUS). Various salicyl compounds may be administered. In some cases, particularly the inflamed ones, the effects are often favourable. The dose must be a generous one, and usually several days elapse before any

benefit is shown. Thyroid is, or rather was, a very favourite remedy, and it undoubtedly causes the disappearance of the eruption in many cases; but the dose required is often a dangerous one, and it should be used only in such cases as respond to moderate amounts. It is perhaps best prescribed combined with a small dose of arsenic, as recommended by Ewald. Large doses (1 drachm t.i.d.) of iodide of potassium may sometimes be administered with benefit, but there are many disadvantages, including the expense of the drug, attending this treatment, and it is not often resorted to. Every now and again one meets with a case which improves markedly under doses of a quarter of a grain of the green iodide of mercury given thrice daily. Unfortunately, though many dermatologists are familiar with the good results occasionally produced by this remedy, no one is able to indicate the sort of case in which these may be expected. But no harm results from an experimental trial in obstinate cases.

External Treatment.—Perhaps the most important points to realize in connection with external treatment of psoriasis are the almost invariable presence of the disease in the scalp, and the importance of treating it in this situation. If the body surface alone be dealt with, no matter how successfully, the eruption will inevitably extend from the untreated scalp. Systematic washing of the scalp with soap spirit, and the application of some suitable drug, are essential to success. The most commonly prescribed drug is salicylic acid; but sulphur, pyrogallol, resorcin, white precipitate, and tar are all valuable. For the eruption on the body and limbs one has a rich choice, which must be determined in each individual case by the form and extent of the disease, and by the circumstances of the patient.

Chrysarobin, which is certainly the most efficient application, has so many disadvantages that, unless full advantage be taken of its virtues, the disadvantages outweigh these. The ordinary plan of rubbing the ointment in twice a day, and allowing the patient to go about, involves a treatment extending over weeks, and is generally unsatisfactory even then. The writer never uses chrysarobin except as follows, and then only after explaining to the patient the object of the treatment:—

An ointment of 5 per cent chrysarobin is applied to the skin after a bath. This is well rubbed in, and pieces of lint freely spread with the ointment are applied to the affected surfaces, and bandaged on. This application is renewed twice daily. In five or six days there is marked improvement, and in eight or ten the discomfort is considerable, the healthy skin being violently reddened, and the diseased spots standing out white against it. If possible, the treatment should be continued with a diluted ointment or paste (say 2 per cent) until the redness is universal. Some soothing application, such as zinc paste, is then made, and in a few days desquamation takes place.

It is important to keep a strict look-out for any patches which are lagging behind, for the treatment is so disagreeable that it is not easy to keep it up on isolated patches after the greater part of the eruption is gone. These may be dressed, in addition to their share in the general treatment, with a strong compound chrysarobin ointment, made as follows: chrysarobin, 10 parts; acidum salicylicum, oleum rusci, of each 20 parts; vaseline 50 parts. This almost dissolves the spots away, and must be used with caution. If the patient be unable to submit to this treatment, which involves confinement to the house, the use of chrysarobin should be eschewed; and of the various other remedies, the most generally useful is tar, which may be used in the form of ointment, or as a varnish, such as: pix carbonis, 1 drachm; benzol, 2 drachms; acetone, 1 oz. This has the great advantage over ointments that it dries almost immediately, and, though not quite so efficient, is in the majority of cases more likely to be persevered with than the more unpleasant ointment. Common crude gas-works tar is often very useful, and usually very cheap. It should be applied with a stiff brush in as thin a layer as possible. Another application commonly made is salicylic acid, regarding which it is necessary only to say that, though perhaps the most cleanly of all preparations, its effects must be watched, for the drug is readily absorbed when applied over a large area. With some hesitation, for his experience with it is not very extensive, the writer records some excellent results from the local application of olive oil, either alone or along with a small amount of salicylic acid or one of the tar oils (oleum cadini, oleum rusci, etc.). The comparative cleanliness of this method makes it popular with patients.

To the chronic sufferer from this disease one or other of the many spas should be

suggested. There is no doubt, though the effects of these are not all that is claimed for them by the physicians practising among them, that baths, particularly sulphur baths, have a distinctly beneficial influence, and intelligent patients are often convinced that they suffer less during the year following a course of these than in other years. If the patient's bath is a porcelain or white enamel one, excellent sulphur baths can be made by adding two ounces of liver of sulphur to each bath. But the patient must be warned of the effect of the sulphur on all metals in the bathroom.

Recently, electricity has been used in this as in so many other diseases, and it has been demonstrated beyond doubt that under high-frequency currents and *x* rays psoriasis does sometimes disappear. To the former probably no objection can be urged; but it seems doubtful how far, at least systematically, one should use, in the treatment of a benign disease, a remedy so potent for evil as the *x* rays.

After the psoriasis has been temporarily got rid of by any method, the patient should have impressed upon him the necessity of keeping the scalp free from dandruff, and should be urged, even if no sign of the disease appear, to keep up the systematic washing of the scalp, and the application of salicylic acid—the least unpleasant of the applications mentioned—for at least several months, and the longer the better. *Norman Walker.*

PSYCHONEUROSES.—The morbid conditions denoted by the term psychoneurosis have varied according to the ideas of the different writers who have used the word. Thus, as employed by Morton Prince, it means a synthesis of functions into a complex which does not serve a useful purpose but rather is harmful to the individual. Krafft-Ebing uses the term as covering all diseased states of the normal brain other than those associated with an anatomical lesion, thus including melancholia, mania, and delirium, and excluding neurasthenia, hysteria, hypochondria, etc. Dubois, on the other hand, makes the word include "neurasthenia, hysteria, hysterical neurasthenia, and the lighter forms of melancholia and hypochondria". Freud classifies neurasthenia and anxiety-neurosis as actual neuroses (presumably somatic in origin), while he uses the term psychoneurosis for hysteria (both of the 'conversion' and anxiety types), together with phobiæ and obsessional states. Bernheim specifically excludes neurasthenia from the psychoneuroses.

Considering then this latitude of denotation, we may be allowed to make use of the word in a vague but not unserviceable way, to include the conditions frequently referred to as 'functional nervous diseases', without pledging ourselves to any strict classification, whether on an etiological or symptomatic basis. At the present stage of psychopathology, every man's idea on this subject is different from his fellow's. Some can only think of states like obsession in terms of organic processes; for others none but a psychological conception has any significance. One investigator thinks of the mental unrest of exophthalmic goitre as caused by hyperthyroidism; another regards the disease as one the onset of which is generally determined by emotional shock. One man, in treating a case of so-called neurasthenia, restricts himself to a persevering, and often futile, search for some source of auto-intoxication; another sets himself to discover a repressed psychosexual trend; and so on. In short, our conception of disease from the psychic standpoint is so undeveloped, that the first difficulty of the writer on this subject is to attain intelligibility and ensure comprehension. To describe the methods and technique of any department of therapeutics can only be profitable when the pathology and symptomatology are already understood. This cannot be said of the psychoneuroses; and therefore it appears desirable to devote some space to the etiology of these conditions, as being the surest way to make clear the true nature of the therapeutic indications.

Let us then begin with two exceedingly simple postulates, which cannot be considered contentious. The first is merely this: *What mind can cause, mind can cure.* In other words, in so far as a morbid condition is psychogenetic, it is capable of cure by psycho-therapeutic methods. We are accustomed to accept a purely psychic explanation of a few diseased conditions—probably far fewer than will be the case fifty years hence—but we are still very slow to adopt purely psychic methods in dealing with these same cases.

The second postulate is this: *If we accept purely subjective evidence of the existence of a symptom, we must be prepared to accept purely subjective evidence of its cure.* Many

physicians adopt the manner of its cure as a test of the genuineness of a complaint. A backache that did not yield to salicylates and massage, but was cured by an unqualified mental healer, need not be classed as 'imaginary'—if, that is to say, we imply by that term that it was not genuine. On the other hand, it may very properly be called imaginary if we use the word in the sense of psychogenetic.

This point brings us to the very important consideration of pain as produced by mental causes. Hitherto it has been usual to conceive of functional pain as a fictitious by-product of a disordered psychic life. Of later years, thanks mainly to the work of Freud, a new and truer view has been taken by some physicians. It depends on the fact that, in general, a human being prefers physical to mental pain, and that, in consequence, relief from mental pain is experienced on the incidence of physical pain. By this process of transference the patient seeks—unconsciously, of course—to attain peace of mind through a substituted bodily suffering. That this frequently takes place can be proved by any experienced psychotherapist beyond all cavil; yet it is probable that the medical profession in general has only an inkling of the number of obstinate 'functional pains' which are purely psychogenetic. The commonest forms of these appear as headache, lumbago, sciatica, gastralgia, appendicular colic, and neuralgia (generally referred to as 'neuritis'), the latter especially in the shoulders and eyes.

The particular factors which determine the form and location of the painful condition in each case are too complicated and technical to be entered into here, but the following examples may be referred to. A girl deeply in love has a misunderstanding with her fiancé; she keeps the whole affair to herself, and suffers intense mental pain; she is in great perplexity as to whether she should write and offer an explanation; she develops 'rheumatic neuritis' in her right shoulder and arm; the doctor orders the limb to be put at rest, and forbids writing. Hence the general conflict between aspiration and actuality is relieved by the bodily pain, while the particular conflict between writing and keeping silence is relieved by the nature of the pain (defence symptom), which determines the alternative to be chosen.

A nurse suffers from great pain in the right elbow and forearm; all ordinary treatments are unsuccessful; after an attempted suicide, analysis reveals the fact that she is a confirmed masturbator, and that the pain is located in the arm used, and depends in intensity on the frequency of self-indulgence.

A woman of thirty, happily married for eight years, and the mother of two children, has had abdominal crises (pain, spasm, vomiting, diarrhœa) at intervals of one to six weeks for twelve years. Treatment has been continuous and varied—massage, baths, drugs, diet, appendicectomy, etc., etc. By dream-analysis the entire condition was traced back to an attack of colic after a severe illness, during which an intense emotional conflict had been set up over a very passionate *affaire du cœur*. The emotional state had been 'fixed', and the nature of the physical pain was determined by synchronism.

Apart from this conception of pain as being of psychic origin, there are of course many other forms of psychoneurosis, the nature of these being vascular, secretory, or co-ordinative, and, less frequently, purely motor or sensory. In the first group we have morbid blushing, asthma (in many instances), and stammering, all of which are common conditions that are relatively little studied by clinicians; whereas the much rarer functional hemiplegiæ and anæsthesiæ of the second group are constantly being lectured about and reported. As a matter of fact, the importance of the psychoneurosis is but a poor indication of the extent of the psychic disturbance. Many physicians seem incapable of realizing the extent to which, in abnormal individuals or in abnormal psychic states, the vasomotor system responds to emotional changes. It is usual to think of ordinary blushing as the limit of psychovascular control, and to reject as scientifically impossible such a legend as that of the stigmata of St. Francis. As a matter of fact this particular phenomenon has been produced by two French observers, working under strictly scientific control, on a subject in deep hypnosis.

Freud's Methods—Psycho-analysis.—The mechanism whereby ideas become fixed, and phobiæ and obsessions arise, has been studied very fully by the Freudian school; and though some of their tenets are extreme, and the entire system of their psychology tends to be narrow, it must be admitted that, in the main, Freud's discoveries are epoch-making, and that his methods are of immense value in certain conditions. Like many

other pioneers, the Freudians have shown their inability to conserve what is good in the old, while displacing what is bad in it by the new and better.

As has already been pointed out, Freud divides the psychoneuroses into hysteria, phobiæ, and obsessional states. On the data which he has derived from psycho-analysis he has based a system of conceptual psychology which departs in many respects from the accepted psychology of the day. He begins by drawing a distinction between the conscious and the unconscious which is somewhat at variance with the usual definitions of these terms. He also postulates a 'fore-conscious,' which corresponds to some extent to the 'subconscious' of many other systems of psychology, and which is equivalent to the mental background of the conscious life. The unconscious is, of course, the storehouse of memory, in which every experience is stored up with the normally attached 'affect': that is to say, the feeling tone which has been associated with any given experience remains attached to it, so that when the experience is recalled into consciousness a similar feeling tone accompanies it. Furthermore, every new experience tends to have a feeling tone similar to that which was associated with like experiences in the past. Hence the mind approaches almost all new experiences in life with a bias towards the feeling tone which has previously been experienced in a similar connection.

Freud postulates a censor, which must keep guard, as it were, at the gate of consciousness, to exclude from it memories from the unconscious which might be painful or undesirable, thus representing the tendency of every individual to maintain mental peace by eliminating from his conscious life distressing memories of every kind. When an individual has had an experience of a definitely painful nature, he invariably attempts to promote its elimination from his conscious mental life by a process of purposeful forgetting, and to this process Freud has given the name of 'repression'. Now if the feeling tone or affect associated with an experience is very intense, the process of repression will need to be correspondingly conative or artificial, as opposed to the spontaneous character of obliviscence where neutral memories are concerned. But in this process of active forgetting the affect becomes separated from the 'complex' (the term which is used to denote a group of ideas with an emotional value attached to them).

Let us suppose that an individual has had an experience which has stimulated a powerful desire in his mind. He may deal with that in three ways, which we may conveniently refer to as positive, negative, and neutral. In the first place, the positive treatment of the wish would be to determine to gratify it, in which case the feeling is discharged, and the affect is said to have 'abreacted'. In the second place, he may determine upon various grounds that the wish must not be indulged, and he accepts various conflicting considerations as more powerful than the desire, and thus allows them to overcome it. For instance, he may realize that the indulgence in the desire would conflict with his social ambition, and he may definitely accept his social aspirations as of greater value to him than this particular desire; therefore he treats it in what has been referred to as the negative way, allowing the wish to be cancelled by more powerful, but conflicting, aspirations. Finally, there is the third or neutral way of dealing with the situation, and this is the method that leads to a psychoneurosis. The individual may refuse himself the pleasure of indulging his wish, and he may at the same time refuse to put it out of his mind on grounds of expediency, etc.; but he may derive pleasure from the thought which lived in his conscious mind as a phantasy. This leads to a mental situation which gradually becomes less and less tolerable, till finally something has to be done to resolve it. The obvious solution is what has already been referred to as repression.

Now in every individual there is a certain 'mental breaking point' at which he can no longer tolerate the repression of a powerful emotion. This mental breaking point is of course high in individuals who are particularly stable, and who are at the same time in good health; and low in individuals who are degenerate or particularly unstable, and especially so if they are in bad health at the time. It varies for every individual according to his state of health, mental and physical, at a given moment, and it varies also according to the individual's hereditary characteristics. The normal individual of good mental stability, with good education and wholesome habits of thought-control, has no difficulty, when he is in good health, in tolerating a fair amount of repressed emotion, and can therefore get along in a satisfactory and efficient way in his daily life without any manifestations to indicate the presence of painful submerged complexes. But on the

other hand the weakling, the degenerate, the man who has never developed habits of mental control, the individual who is convalescing from an acute attack of influenza, etc., will not be slow to manifest the presence of a submerged complex—or, as is more probable, of several—indicating that his powers of resistance have been lowered by some cause, either psychic or somatic. In this event, a process will take place which is referred to as the detachment of the affect : that is to say, while the buried complex remains buried, and beneath the level of consciousness in so far as the actual incidence or experience is concerned, the affect or emotion normally belonging to it will make its appearance by some devious channel, physical or psychical. When the affect is transferred to the body, hysteria is developed ; when the affect reappears as an uncontrollable fear, we call it a phobia ; when it makes its way into consciousness as an insistent and meaningless emphasizing of some trivial or neutral idea, we call it an obsession. The manner in which relief is obtained by this discharge of the detached affect through a morbid channel has already been explained above.

With regard to the nature of the psychic experiences which ultimately lead to psychoneuroses, it should be noted that Freud, in his original investigation, laid great stress upon the ' psychic trauma ', a painful psychic experience exactly analogous to the ' fixed emotional state ' of Dejerine. Later, however, Freud discarded the psychic trauma theories, and has tended recently to refer all these conditions ultimately to infantile psychosexual impressions. It is not within the scope of this article to deal with so abstruse a point as this, but it may be pointed out that there is a very large amount of evidence from many different quarters to show that certain morbid conditions which unquestionably deserve to be classified as psychoneuroses have been cured permanently and successfully without carrying back an analysis to infantile experiences.

We now pass to *the methods of treatment* employed by Freud and his school. These all constitute different forms of psycho-analysis, and each has its usefulness.

1. *Hypnotic Analysis.*—This method has been discarded by Freud, who used it in his earlier investigations. It resembles very much the treatment largely used and advocated by Boris Sidis, and known as ' hypnoidal analysis '. It consists in throwing the individual into a state of modified consciousness in which, the control of the discriminating and rational function being withdrawn, it is easier to trace associations which have been buried in the subconscious, and so to reveal the actual complex responsible for the morbid state.

2. *Dream Analysis.*—The analysis of the patient's dreams forms a source of ever-increasing importance in obtaining the material for a successful investigation of a psycho-neurosis. Freud's work upon this subject is unequalled for extent and originality ; and it is doubtless becoming every year easier for the average medical man to attain a superficial knowledge of dream interpretation which will allow him in many of his cases, with comparatively little trouble, to form an opinion as to the individual's mental life which otherwise would have necessitated much more laborious investigation. According to Freud's psychology, every dream is divided into two parts, the manifest content and the latent content, and it is only from the latent content that the associations of real importance can be reached. A dream is, in general, a compromise whereby the conflict between aspiration and actuality is resolved by this form of phantasy. In order that the true nature of the dream may be disguised from the ego, and thus interfere as little as possible with the mental peace which is desirable for sleep, the whole train of thought is subjected to various processes of disguise known as condensation, dramatization, and inversion. The actual technique of dream interpretation is, of course, very elaborate ; but at the same time it is possible for every physician to take a practical interest in it, although he should be chary about basing definite conclusions on a superficial dream analysis.

The following instance is useful, in the first place because the patient was a doctor, and in the second place because it is a very typical instance of the childish kind of punning which is so common in dream consciousness, and which is responsible for many of the associations, symbolisms, etc., for which the Freudian school has incurred criticism.

The patient had just undertaken some professional work for a colleague, and promised to attend five of his patients ; one of these cases, that of a priest, was very complicated ; the rest of them were relatively simple. He dreamed that he was sitting at a desk, holding a prescription in his hand ; the doctor who was going on holiday was looking over his shoulder ; the patient saw that one of the items in the prescription was Tr. Benzoini

Co.; he could not remember the others. He said to his colleague, "That is the only item that matters in that prescription." On associating over 'Tr. Benzoini Co.', the meaning was revealed: Friars' Balsam—Friar—Priest. The five items in the prescription were, therefore, the five patients.

It is often said that Freudian interpretations of dreams are arbitrary; but those who have no experience must accept, on the authority of those who are experienced, the two following points:—

a. Before asking a patient whether he has any recurrent type of dream, it is very often possible for the observer to speculate with amazing precision on the answer. For instance, the types of patients that dream of train-catching, or walking on edges of precipices, or snakes, become familiar to the psychotherapist who gives any sort of observation to the matter.

b. When the interpretation of an image is reached by free association, the patient is aware of its correctness, and very frequently manifests considerable surprise, horror, or amusement. Usually the analyst has no scope for being arbitrary in the way that is usually attributed to him, because an artificial interpretation evokes no confirmatory response from the patient.

3. *Time Association*.—This is an interesting method which has of late fallen into disfavour amongst many psycho-analysts, but it is none the less of considerable value, especially to the beginner. A series of a hundred words is taken, and as each word is called out by the observer the patient utters the first associated word that comes into his mind. This is noted, together with the exact time. The average reaction time for normal adults is found to be 2·4 seconds. Each reaction provides information, both in the character of the reaction word and in the length of the reaction time. When the whole series has been gone through in this way, it is repeated, with a view to obtaining a reproduction of the same reaction word for each stimulus word. When the test has been completed, information can be derived from the average reaction times, the maximum reaction times, and the nature of both reaction and reproduction. It is possible to hit upon clues of a most striking character at times, the words in question being called 'complex indicators'. For instance, a married woman, who had suffered from neurasthenic symptoms for all the fifteen years of her married life, gave good average reaction times and very commonplace reaction words all through. There were two exceptions, one of which was the following: Baker—Butler—16·2 seconds. The association referred, of course, to Joseph's dream, and in itself was not specially indicative; the very prolonged reaction time was obviously important; and on further investigation it was found that she had been seduced by a man of the name of Butler before her marriage. This was the repression that had affected her psychic life all these years; and the ease with which it was discovered was chiefly due to the method employed.

4. *Free Association*.—This is the method of psycho-analysis most largely used at present. The patient is put into a state of somewhat modified consciousness. Even though no special methods or instructions are resorted to for this purpose, the fundamental aim of the observer is to produce a state of consciousness in which the attentive field is so diffuse that association takes place more spontaneously than in any normal waking state. The physician uses words, episodes, or characters from the patient's previously supplied account of his case, or from his dreams that have already been noted down, and from these he strives to get associated ideas that will reveal the true value and significance of the various concepts and complexes in the narrative.

Having now reviewed—very imperfectly, but as concisely as possible—the Freudian views and treatment of the psychoneuroses, we may be allowed to refer to other methods employed by different schools of psychotherapy for their treatment.

Hynotism and Suggestion.—These are used very largely, and to an increasing extent in recent years. For full information on this subject, *see* HYPNOTISM.

Persuasion.—This is the term used technically to cover such psychotherapeutic methods as are carried out in a state of normal consciousness. This is, obviously, an essential factor in all medical practice, although the physician who cultivates it is apt to refer to it (with modest pride) as suggestion. Persuasion consists in a variety of expedients whereby we strive to alter the patient's mental attitude. Psychologically, persuasion differs from suggestion in that, whereas with suggestion the mental change

is on an inadequate rational basis, with persuasion it is, or should be, on an adequate one. The ability of the physician to carry out psychic treatment of this kind will, of course, depend entirely on his own outlook on the case. If he believes or suspects that the symptoms are entirely accounted for by a morbid physical process, he can only attack the case from the physical point of view; but if he has a clear conception of a psychic etiology, either partial or complete, he will be able with a little resource and common-sense to alter to some extent, if not entirely, the patient's mental attitude towards his suffering. Though the technique of the method of persuasion is unimportant when the physician has a true comprehension of the case, it may be helpful to enumerate a few of the doctrines which have to be most frequently instilled into the patient's mind.

1. Every abnormality of peripheral stimulation, from a mosquito-bite to angina, has a psychic factor in apperception. That psychic factor may be great or small, depending as it does on the level of the threshold of consciousness at the time being, but it must be recognized. The threshold is never at a constant level, even normally. Hence the perception of pain involves a factor which can be controlled by the individual.

2. The passive attitude towards physical pain logically implies a lowering of the threshold, and is the negation of the active attitude, which—with comprehension—involves a raising of the threshold.

3. To indicate that a symptom has a partial or complete psychic origin does not imply in any way that the patient is malingering or is (in the popular sense of the term) hysterical; therefore inability to control a symptom before explanation and education does not imply a similar disability afterwards.

4. An objective symptom, particularly if the mechanism is vascular, may well have a purely subjective origin.

5. It is a universal tendency of human beings to evade the responsibility for disease by transferring its presumed origin from the mental to the bodily sphere.

6. It is only a partial cure which depends on the modification of the environment to suit the patient's power of resistance. The man who is content to expect a limited cure will never be surprised by a complete one.

7. If improvement or cure depends on a belief in physician or method, it is only a partial cure. The patient is only cured when he really believes in himself and his own power of controlling his condition.

8. All effort that is expended in controlling symptoms is worse than wasted if apprehension dominates the mental field. Every effort that is put forth to ensure self-confidence is more than repaid.

9. Sufferers from the psychoneuroses are rarely capable of resting (in the ordinary sense of the word) without detriment; and yet the cardinal doctrine of their belief is that rest is essential to them, and exertion intrinsically injurious.

10. It is imperative for mental peace that every painful complex be, as far as possible, stripped of its emotional significance, and that the patient be taught to handle it fearlessly.

11. In every case of aboulia (weakened will-power) it is of paramount importance to train the patient to make his determinations beforehand—preferably the day before—when the feeling tone of the moment cannot interfere with his efforts.

12. Anxiety and defence symptoms logically demand opposite lines of treatment. It is better not to treat them at all than to confuse them.

13. All occupations which are intended to divert the patient's attention from introspection should be selected on the ground of being the most suited to satisfy suppressed tendencies—e.g., the married woman whose maternal aspirations are unfulfilled will do better breeding chickens than playing golf, because in the former occupation there is free scope for the sublimation of certain factors in the thwarted parental instinct.

It will thus be seen that the physician in practising methods of persuasion is endeavouring to bring the psychoneurotic to deal with his affective life in a wholesome way—i.e., in either of the ways that have previously been referred to as positive or negative—and to instil into him the danger of playing with his phantasy in the neutral way already described.

Provided the physician fully realizes the different spheres in which these various methods may be employed, there is no reason why he should not employ them all; no

is there any reason why the different schools advocating these various methods should exhibit such antagonism as is the case. The future of psychotherapy will unquestionably depend upon a blending of the various methods at present used, as well as on a considerable abbreviation of the methods at present employed for analysis; and associated with this will probably come a much broader outlook with regard to the applicability of different methods of psychotherapy to different cases and individuals.

Re-education.—In conclusion, reference must be made to the methods which are technically grouped under this heading; of these, the most important are the ones which refer to *attentive control*. Will-power is essentially the power of determining the area and focus of attention, in that all conation is determined by the perceptions and appetitions within the field of awareness. For this form of re-education many of the ordinary methods of education are valuable, and many other expedients can be easily devised. All breathing exercises are intrinsically methods of developing attentive control, and have been known and practised by oriental mystics for thousands of years. The rationale of these exercises depends on the very simple fact that as soon as the volitional control of the respiration flags—in other words, as soon as the mind wanders—the breathing reverts to the normal automatic rhythm, thus providing an unfailing objective indication of the subjective change. All exercises such as adding up columns of figures, proof-correcting, striking out a given letter in a column of print, balancing, etc., can be utilized. Vittoz, of Lausanne, has elaborated a very full system of simple exercises which are of great help to many patients of the diffuse and absent-minded types, in spite of the fact that his presentation of them is painfully empirical.

Finally, the practitioner whose idea of the value of psychotherapy depends on a printed list of diseases, will necessarily make mistakes, both of omission and commission; whereas he who has firmly grasped the fundamental principles which this article is intended to set forth, will realize that the field of psychotherapy is not only a very wide, but an elusive one, with ill-defined boundaries and shifting frontiers; that in many diseases symptoms are partly somatic and partly psychic in origin; and that only careful study of each case, without bias or prejudice, can determine the true place of psychic, as opposed to physical, methods of treatment. (*See also* HYPNOTISM, HYSTERIA, NEURASTHENIA, INSOMNIA, DRUG HABITS, DIPSOMANIA.) *H. Crichton Miller.*

PTERYGIUM is the triangular portion of conjunctiva which invades the cornea, always in the line of the palpebral aperture, usually from the inner side, only very rarely from the outer. It occurs especially in eyes which have been exposed to weather or dust. Treatment is called for only under two conditions: (1) When the pterygium is advancing, in which case the apex is red, succulent, and fleshy; (2) When, though stationary, in which case the apex is flat and membranous, its appearance is unsightly.

Its removal is a simple matter. We only have to bear in mind that the head is firmly adherent to the cornea, and must be got away completely. After instilling a few drops of cocaine, the head is picked up with a pair of forceps, and is pared off with a very sharp knife right down to the corneal tissue. This being done, two converging incisions are made in the conjunctiva from the upper and lower margins of the head, meeting about a quarter of an inch from the limbus, and the included portion of conjunctiva, together with the excised head, is removed.

Some prefer to remove first a triangular portion of conjunctiva up to the head of the pterygium, and then to tear off the head from the surface of the conjunctiva. In either case the main point to keep in mind is the complete removal of the head itself. To allow of the cut edges of the conjunctiva coming together nicely, a small vertical incision is made in the conjunctiva at the limbus, both above and below, and the edges having been freed by undercutting, they are brought together with two or three sutures placed very close (about 1 mm.) to the cut margin. The eye is bathed daily with boric lotion and kept bandaged for three or four days. If the stitches have not cut out by the fourth day, they can be removed. *W. Tindall Lister.*

PTOSIS.—(*See* EYELIDS, DISEASES OF.)

PTYALISM.—(*See* SALIVARY GLANDS, AFFECTIONS OF.)

PUERPERAL SEPSIS.—The treatment of puerperal sepsis is so entirely based on pathology and bacteriology that it is impossible to discuss it adequately without first taking a brief survey of the factors concerned in the causation and morbid anatomy of the disease.

The condition called in the past ' puerperal fever ' is now known to comprise many different lesions of the genital tract, with only this in common, that they are all due to infection by micro-organisms. The infecting organism differs in different cases. The following results of an investigation into the bacteriology of puerperal infections, carried out some years ago by the writer and A. G. Foulerton, may be briefly given.

The normal puerperal uterus is probably nearly always sterile, but the vagina usually contains organisms, rarely however of much pathological virulence. In puerperal pyrexia organisms are found in the cavity of the uterus in the large majority of the more severe cases (those with a temperature over 100°). The organism most commonly present is the streptococcus. Any variety may be met with, but *fæcalis* and *erysipelatosus* are the commonest. In a smaller number of cases pneumococcus or staphylococcus can be isolated. *B. coli communis* is very generally met with. In severe or actually fatal cases it is very frequently conjoined with the more virulent organisms named.

In the slighter degrees of puerperal pyrexia, the uterine cavity is either sterile or contains staphylococci and other organisms of less virulence. In those cases where the uterus is sterile, the fever is due to infection of vaginal or cervical lacerations, usually by staphylococci or colon bacilli ; but other organisms, including streptococci, occur occasionally. The anaerobic bacteria, which were stated by some German authorities to play a considerable part in puerperal sepsis, were rarely found by us, and never in circumstances suggesting that they materially affected the process. The gonococcus, while occasionally the cause of puerperal pyrexia, is relatively uncommon.

Our findings, therefore, indicated that the processes concerned in puerperal pyrexia are identical with those of wound sepsis occurring in other parts of the body, and that the conception of a ' sapræmia ' as distinct from wound infection has no foundation in fact.

The lesions of puerperal fever are divisible into three groups : (1) The primary lesion, i.e., the point where the organism first finds entrance to the tissues. This is usually situated in the natural wound of the placental site, but it may occur at a laceration of the uterine, cervical, or vaginal wall ; (2) The consecutive lesions, which proceed from the primary by direct extension along lymphatics, veins, and other natural channels. To this group belong the peritonitis, cellulitis, and phlebitis, so commonly seen in puerperal sepsis ; (3) The generalized lesions, due to septicæmic or toxæmic conditions of the blood, and of which septic pneumonia, ulcerative endocarditis, or acute toxic degeneration of the heart muscle or liver are good examples.

The organisms of puerperal infection may be either of *extrinsic* origin, the organism being brought to the patient from without ; or *intrinsic*, when they already pre-exist in the body.

In regard to those of extrinsic origin, the medium of conveyance is usually the hands or instruments of the attendant. As regards those of intrinsic origin, the uterine cavity, normally sterile, may be infected before labour ; the vagina may contain actively pathogenic organisms such as the gonococcus or even the streptococcus ; while the streptococcus is found with some frequency in the vulva. Finally, the anoperineal skin is always heavily infected with organisms derived from the bowel, all of which are of potential virulence. *Streptococcus fæcalis* can always be isolated from the large intestine, and other varieties such as *erysipelatosus* are occasionally present there. It is probable that the larger proportion of cases of puerperal sepsis are due to infection by the patient's own organisms, which in most cases are derived either directly or indirectly from the bowel. It is not necessary that the bacteria should be implanted directly on the placental site, for C. J. Bond has shown that minute particles placed in the vagina are carried upwards into the uterus by an upward flowing current along the vaginal and uterine walls in the reverse direction to the main flow. In short, infection of the placental site may occur from the organisms being merely carried into the vagina by the hands or instruments of the attendant. Lastly, organisms may make their way from the bowel to the genital tract by direct passage through the tissues, especially under conditions of tissue damage.

Bearing in mind this slight sketch of the new processes at work in puerperal sepsis, a discussion of its treatment may now be proceeded with under the heads of : (I) *Prophylactic*, and (II) *Curative treatment.*

I.—PROPHYLACTIC TREATMENT.

The importance of cleanliness and cleanly surroundings to a lying-in woman should be sedulously impressed on the lay mind. The filthy conditions under which labour often has to be conducted amongst the lower classes are notorious. The continued occurrence of puerperal sepsis is often held up as a reproach to the medical profession ; how unjustly may be seen from the fact that in lying-in hospitals where the will of the doctor is supreme, the disease in its graver form is rarely seen.

In this regard a duty lies with the public as well as with the practitioner, for it is

impossible to conduct a labour single-handed in a dirty patient amongst dirty surroundings, and yet preserve surgical asepsis.

The use of sterilized rubber gloves is strongly to be insisted on. They protect the patient and the practitioner, the former from the importation of sepsis on the hands of her attendant, and the latter from infection of his hands by vaginal or vulvar organisms. All instruments and appliances must be boiled before use.

As regards the conduct of labour, the practitioner must bear in mind that *infection by intestinal organisms is most of all to be guarded against.* The anus should be excluded from the birth area in all operative cases by fixing over it by clips or stitches a gauze pad soaked in an antiseptic. The vagina and anoperineal skin should be sterilized as far as possible by the application of a solution of iodine, or one of the aniline or chlorine antiseptics. The dorsal position has, as regards antiseptic technique, great advantages over the commonly-used side posture.

A well-retracted empty uterus is the least favourable to the growth of organisms; and bruised devitalized tissue is a direct incentive to the occurrence of sepsis. Where intra-uterine manipulation has been necessary, the uterine cavity, after being thoroughly emptied, should be well washed out with an antiseptic solution.

The vagina should be swabbed out with a strong antiseptic after labour if anything at all has been introduced into the vagina, and I am strongly in favour of routine vaginal douching during the puerperium, as a reasonable cleanly practice strongly appealing to all women with a sense of nice feeling. The maintenance of dorsal decubitus results in the lochial discharge being pent up in the vagina, with the result that often it becomes offensive. The modern practice of encouraging patients to sit up, and even to get up, on the second or third day, has everything to recommend it on the score of free drainage from the uterus and vagina.

II.—CURATIVE TREATMENT.

The curative treatment of puerperal sepsis may be divided into *operative* and *non-operative treatment.* Before discussing these, however, it is necessary to emphasize: (1) The necessity for early active measures if good results are to be expected; (2) The importance of getting as soon as possible a bacteriological report of the germ contents of the uterus.

1. *The Necessity for Early Measures.*—It cannot be too strongly emphasized that the successful treatment of puerperal sepsis chiefly depends on the earliness with which the disaster is recognized and treatment is initiated.

Every one has a natural tendency to dissent from the view that a case under his care has gone septic. Thus several days are not infrequently wasted on the assumption that the fever is due to the 'milk coming in', to constipation, to influenza, or to any other straw to which the self-persuaded judgement can cling. The vast bulk of cases of pyrexia in the puerperium are due to septic infection of the genital tract. Many, by aborting, lend colour to the mistaken diagnoses cited, and bias the practitioner's judgement for future cases. All cases of pyrexia in the puerperium should be assumed to be due to sepsis until good proof is forthcoming that they are not so. Pending such proof they should be treated as septic. A temperature of over 100°, maintained for twenty-four hours, is an indication to act; a temperature over 101° is an indication for immediate action. To treat as septic a case not in reality so is a far less grave error than to delay treatment until puerperal infection has so established itself that the possibility of curing it becomes a matter of grave doubt.

2. *The Importance of a Bacteriological Report.*—For this purpose a piece of wool sterilized by heating or flaming, mounted on a long forceps, may be thrust through the cervix, the latter having been exposed by a speculum. If this is not feasible, the swab should be passed into the vaginal vault, and a specimen of the lochial discharge obtained just as it leaves the uterus. Where the uterus is about to be explored under an anæsthetic, the passage of a swab into the uterus is simple. Further, the fragments of clot and detritus brought away by the finger should be preserved for examination. In either case the swab or fragments should be placed in a test-tube sterilized by boiling, and plugged with cotton-wool passed through a flame. It should then be despatched to a competent bacteriologist with a request for: (*a*) An immediate microscopical report; (*b*) A report of

the result of culture; (*c*) The preservation of the cultures, in the event of a pathogenic organism being isolated, in case a vaccine should be required later.

If the practitioner possesses the necessary bacteriological knowledge and a $\frac{1}{12}$ oil-immersion objective, he can make an immediate smear preparation himself, staining it with methylene blue, or better, by Gram's method.

In cases where a general blood infection is feared, the blood should be examined. For this purpose a considerable quantity should be withdrawn from one of the superficial veins by means of a sterilized syringe (a serum syringe for instance, if a fine needle can be affixed to it), and immediately used to inoculate culture tubes. As the process requires a degree of special skill, it is better in most instances to get the bacteriologist to do this.

The following should be requested: (*a*) A report as to culture; (*b*) A report on the leucocyte count. The former is the more important, but the latter is sometimes of use where, a pelvic mass being felt, the question of the presence of pus has to be decided.

Operative Treatment.—*Uterine Exploration.* Uterine exploration is only of value when carried out early. It should be performed under anæsthesia, on an operating table, with the woman in the lithotomy position. The operator first thoroughly swabs the vulva and vagina with an antiseptic, and then introduces one and afterwards two fingers through the cervix. By making pressure with the left hand on the fundus of the uterus, every part of its cavity is rendered accessible. This is then evacuated of any retained clot or débris, and the wall, and particularly the placental site, are scraped with the gloved finger-tips until no further loose fragments are detached. The fingers being withdrawn, the uterus is swabbed out with a strong antiseptic such as 2 per cent iodine, 1–500 'flavine' or 'eusol,' or Milton's solution, and the external parts having been cleaned up the patient is allowed to come round from the anæsthetic. The effect of uterine exploration is usually good when carried out within twenty-four hours of the initial rise of temperature. It is increasingly less successful after this period, because the organisms penetrate deeper into the uterine wall as time goes on—moreover there is a risk of disturbing thrombi in the vessels of the uterine wall by the manipulations necessary for exploration, and thus converting a purely local process into one of general septicæmia. Much judgement is required in deciding whether to explore the uterus or not in any given case. If it appears likely that a portion of placenta, membrane, or blood-clot is retained in the uterus, the indication is strengthened, and vice versa.

Curettage.—The practice of curettage in puerperal sepsis is lauded by some experts and condemned by others. Its object is to ablate all infected tissue from the uterus. In puerperal infection the organisms are located not only in the clot and débris inside the uterus, but also more or less deeply in its wall.

To ablate completely all the infected tissue would necessitate extensive denudation of the surface, and this attained, there is no possibility of excluding the chance of re-infection. If curettage is employed, it should be followed by the use of a strong antiseptic, such as tinctura iodi fortis, applied on wool swabs. A large sharp curette is required, and the patient must be placed in the lithotomy position. The operation takes some little time, and is a more severe procedure than simple exploration.

General Remarks on Cœliotomy.—In bad cases of puerperal sepsis the infection is no longer limited to the uterus, but has spread to the peritoneum, and to the cellular tissue, large veins, and trunk lymphatics of the pelvis, whilst in many instances a generalized infection is present as well.

In considering the propriety of a surgical attack on the consecutive lesions of puerperal infection, the possibility of a co-existent generalized septicæmia is to be taken into account, for in its presence the likelihood of operative measures proving successful is small. On the other hand, the distinction between a generalized septicæmia and a profound toxæmia of local origin is often difficult. But the most difficult point of all is the diagnosis of these consecutive lesions, the signs of which are as a rule obscure. Thus the only evidence of peritoneal infection as a rule is slight distention and tenderness over the lower abdomen, while extensive thrombosis of the broad ligament veins may at first produce no tangible swelling.

Therefore it happens that the idea of opening the abdominal cavity does not arise as a rule until the disease is already very far advanced.

Drainage of the Pelvic Cavity.—The pelvic cavity in bad cases of puerperal sepsis

usually contains a blood-stained serum containing streptococci in large numbers. In many instances there is no peritonitis, the condition being one of infection without inflammation, a peculiarly fatal conjunction. In other examples frank peritonitis is present. Drainage of the pelvic cavity may be effected either through the vagina or through the abdomen, or by both routes simultaneously.

Vaginal drainage is easily effected by incising the posterior vaginal fornix into Douglas's pouch. The opening having been made, a tube or gauze packing must be inserted, or it will rapidly close. The method of Pryor consists in first exploring the uterus and packing it with iodoform gauze, and then opening the posterior fornix and packing Douglas's pouch with the same material.

Abdominal drainage is effected through a middle-line incision in the first instance; but if extensive peritonitis be found, other incisions should be made over the flanks and iliac region. Tubes are inserted through the openings, and the patient is propped up in bed to promote drainage. Before inserting the tubes the pelvic cavity is mopped clear of the serum it contains, and in some cases definite operations on the Fallopian tubes or uterus are also necessary.

After the employment of drainage, either by the vaginal or the abdominal route, continuous saline infusion is strongly indicated. It may be administered either subcutaneously or per rectum. The details of the methods will be referred to later on.

Salpingectomy and Oophorectomy.—The spread of puerperal sepsis from the placental site to the pelvic peritoneum may occur through the uterine wall or through the Fallopian tubes. If limited to the latter route, the removal or ligature of the tubes would be logical. Unfortunately it is rarely so limited, and in any event the peritoneal infection is already advanced before operation is undertaken. As a rule the tubes merely appear a little swollen and red, and a whitish-looking serum can be squeezed out of them. Occasionally, however, they contain definite collections of pus. In such cases they should be removed. The ovaries sometimes contain abscesses, and in this event one or both will have to be removed.

Hysterectomy.—Cure of puerperal sepsis has been sought in removal of the infected uterus. The operation has been performed sufficiently often to show conclusively that it should never be done except under one of three conditions: (1) When the uterus is ruptured; (2) When it contains an infected myoma; and (3) When an abscess or abscesses are present in the uterine wall.

If the infection was limited to the uterus the removal of the latter would be rational, but in all cases sufficiently bad to warrant an operation of this magnitude, it has spread into the peritoneum, cellular tissue, and large veins. The patients are already very ill, and stand a severe operation badly, while the opening up of large areas of cellular tissue to infection cannot be avoided.

In the exceptional circumstances named, however, the uterus must be removed, though in the case of a large solitary abscess, drainage of the sac might be employed instead.

Ligation of the Pelvic Veins.—The most important consecutive lesion of puerperal sepsis is thrombophlebitis of the veins draining the placental site, and it is often accompanied by a perivenous lymphangitis. The veins accompanying the ovarian arteries are those affected in the majority of the cases. Ligature or removal of the infected veins was first recommended on the analogy of ligature of the internal jugular vein for lateral sinus thrombosis, the object being to block the routes of septic absorption. The occurrence of a rigor or rigors indicates phlebitis, and if a definite thickening can be felt in the line of the ovarian vessels along the upper part of the broad ligament, the presumption that the ovarian veins and accompanying lymphatics are infected is strong. Under these circumstances ligature of the veins as high as possible, or complete removal of them, can be performed with good chances of success. If it is found that the infection is not limited to the ovarian veins and lymphatics, but involves the uterine veins as well, the operation becomes much more difficult and its chances of success are much less.

The operation may be either extraperitoneal or transperitoneal, the latter being the better in my opinion, because all the veins can be reached through one incision. In some cases it suffices to place ligatures round the ovarian veins only, but in others the internal iliac veins of both sides may also have to be dealt with. The ligature must be placed above the thrombus, but the vein need not be divided.

The operation has not been much performed in this country, but I am favourably impressed with its results in certain cases. It should be reserved for the more prolonged type of case with repeated rigors, especially when a definite swelling due to thrombo-phlebitis can be felt in the broad ligament.

Drainage of the Cellular Tissue.—In some of the more prolonged cases of puerperal sepsis an abscess forms in the broad ligament, and may attain a large size, burrowing into the thigh or buttock. Abscesses of the broad ligament must be evacuated by incision as soon as they are diagnosed. As a rule the swelling tends to mount upwards into the iliac fossa, and is best incised just above Poupart's ligament ; but where it burrows downwards and presents as a hard mass in the vagina it is best opened there. Very large abscesses require incisions at several points, especially if they have extended outside the pelvis into the buttock or thigh. After incising, a large-sized drain tube must be inserted. As the discharge grows less, one of a smaller size may be substituted, which later is removed altogether.

Other Operative Measures.—The remaining surgical measures used in puerperal sepsis do not require separate mention. They consist in evacuating the pus and draining the secondary inflammatory foci which manifest themselves in some of the septicæmic (pyæmic) types of the disease. Thus an empyema may require resection of the ribs, or an hepatic abscess incision.

Non-operative Treatment.—*Douching.*—The use of an intra-uterine douche uncombined with any other form of treatment is not to be commended. It is not always easy without an anæsthetic to douche out the uterus satisfactorily ; more often than not the fluid fails to be distributed all over the cavity. But perhaps the greatest reproach to the intra-uterine douche is the frequency with which its use is adopted, to the fatal postponement of more radical measures. It is very doubtful whether the proceeding as ordinarily carried out does much good, whilst in some cases it undoubtedly distresses the patient greatly. If the uterus has been thoroughly emptied by the fingers, nothing further can be expected from the douche in this respect, whilst it is impossible to believe that a weak antiseptic solution, ill applied, can affect organisms implanted in the uterine wall. Intra-uterine douching, if done at all, should be used *after exploration under an anæsthetic.*

Vaginal douching, on the other hand, should always be employed. In the case of intra-uterine sepsis it frees the vagina of a puddle of retained bacteria-laden lochia, whilst if vaginal or cervical lacerations be present, it is directly curative. It should be carried out frequently, say every four hours, and the solution used should be weak boric acid, or much diluted lysol or cyllin. In cases where infected perineal or vulval lacerations are present, much benefit, besides comfort to the patient, is obtained by substituting warm boric acid fomentations every four hours for the usual pad or diaper. Peroxide of hydrogen (10 vols.) is a useful local application.

Intra-uterine Applications.—The application of a powerful antiseptic to the interior of the uterus has more to commend it. Its use after exploration or curettage to prevent re-infection has already been mentioned. For such applications to be done efficiently, the patient must be in the lithotomy position with the cervix pulled down and exposed. Previous to the application the interior of the uterus should be explored as already described. The application should be made by a wool swab mounted on a long forceps, and before this is inserted the cavity should be mopped dry as far as possible.

Serum Therapy.—The results of serum therapy in puerperal sepsis are disappointing. In some cases very marked improvement follows the administration of an immune serum, but not in others. There is no doubt that in the worst cases the toxæmia is complex in character, on account of the several species of organisms present in the uterus. Thus in nearly all the fatal cases of the series investigated by the writer and Foulerton, *B. coli communis* was isolated from the uterus as well as organisms of the pyogenic cocci group. The importance of immediately obtaining a bacteriological report on the organisms contents of the uterus has already been insisted on. Where this has been done, and the infecting organism distinguished, an appropriate serum may be administered. In most cases this will be antistreptococcic serum. It should be given in large doses—20 c.c. immediately, followed by another 20 c.c. in six hours, and by 10 c.c. six hours after that. If at the end of that time no beneficial effect is noticed, it is useless to proceed further with that particular serum. The serum should in all cases be 'polyvalent'.

Where it is certain that the infection is streptococcal, and yet no good results follow the administration of a polyvalent antistreptococcic serum, it is well before abandoning the use of serum to try another make, in the hope that the second may contain the correct antidote for the particular variety of streptococcus present in the case.

As regards the method of administration, it is best, I think, to begin with hypodermic injection, but later to give by mouth or rectum. Repeated hypodermic injections are painful, and produce a troublesome serum rash; and further, much larger doses can be given by the mouth or rectum.

In those cases where the nature of the infecting organism is unknown, and pending bacteriological investigation, antistreptococcic serum should be given, if it is decided to give a serum, because of the frequency with which the streptococcus is the cause of puerperal sepsis.

On occasions, the administration of serum, while not followed by marked improvement in the symptoms, appears to benefit the patient slightly, or at all events to assist in preventing the condition from becoming worse. In such circumstances its administration should be continued, for, next to definite improvement, maintenance of the *status quo* in these cases of puerperal sepsis is most favourable. In other words, the longer a patient can be kept alive the better the chance of ultimate recovery.

Vaccine Therapy.—The use of vaccines in the treatment of puerperal sepsis is most indicated in the more prolonged type of case. In fulminant, acute disease but little is to be hoped from it. The cases that exhibit marked variations of temperature, indicating the absorption of successive doses of toxin from the seat of infection, are more favourable to vaccine treatment than those in which the temperature and symptoms are more continuous and constant. Those that are characterized by marked exacerbations and remissions of symptoms over a week or more are the most favourable of all.

The vaccine should be made from the organism isolated from the patient, but in the absence of this a stock laboratory culture may be employed, provided the nature of the infecting organism is known.

The use of vaccines, especially streptococcal, requires great care, for they are potent for harm if the dose and the time of injection be wrongly chosen. I have seen two cases of streptococcal infection in which comparatively mild symptoms were converted into those of the utmost severity within a few hours of an overdose of streptococcal vaccine.

In the case of infection by the streptococcus, a dose not exceeding 2 million should be first given, and in cases of continued fever and constant symptoms a still smaller quantity should be used. Staphylococcal infection and *B. coli* infection require larger doses of vaccine. Where the fever is markedly remittent, the injection is best made when the temperature is as near the normal as it is accustomed to go.

The effect of the vaccine on the pulse and temperature must be carefully noted, and in general it should be administered during a phase of improvement in the patient's general condition.

Saline Infusion.—In certain cases of puerperal sepsis the use of saline infusion is beneficial. Thus, where the pelvis has been drained for peritoneal infection, continuous saline infusion, either into the cellular tissue or the rectum, assists drainage, dilutes the toxins in the blood, and promotes transudation from the vessels rather than absorption into them.

Again, where by reason of vomiting or some other cause mouth-feeding is impossible, life may be maintained for many days solely on saline solution administered by the bowel. In this case the saline solution may be administered in 6-oz. doses every four hours, like a nutrient enema, with a No. 12 catheter and a glass funnel; or the continuous method may be adopted by means of siphon action from a large container. If this plan be used, the inflow must be very slow, the siphon being adjusted till the fluid merely drops out.

Lastly, in cases where vomiting and diarrhœa preclude the introduction of anything into the gastro-intestinal tract, life may still be maintained by continuous saline infusion into the cellular tissue. The siphon apparatus mentioned above is used, but the tube terminates in a hollow needle which is thrust under the breasts or into the skin of the flanks or thighs. The inflow should not exceed half a pint an hour, and it should be stopped directly swelling appears. The proper temperature of the solution for this form of continuous infusion is 108° in the container.

Drugs.—There is not much scope in puerperal sepsis for drug treatment. Alcohol and strychnine are the two most often indicated. They should be given directly the patient's strength shows signs of flagging. Alcohol may be administered as brandy or champagne. Strychnine may be given either by the skin or the mouth, as much as 3 min. of the liquor (B.P.) every four hours. Digitalis and digitalin are not of use, as neither appears to act beneficially on the heart muscle in states of acute toxæmia. Quinine is often prescribed in these cases, but it is doubtful with what propriety. It can have no action on the toxæmia, and its antipyretic properties are scarcely indicated unless the temperature is exceptionally high.

Antipyretic drugs are not indicated to reduce fever, which should be treated by tepid sponging if the temperature is persistently maintained above 103·5°. This, however, is rare, and most cases require no treatment for the pyrexia *per se*. Acetylsalicylic acid is, however, useful to alleviate headache and pain, to quiet the patient, and to assist sleep.

Hypnotics are usually indicated sooner or later, for these patients sleep badly or not at all, the mind being extremely alert, as is common in severe sepsis due to this or any other cause.

Opiates act badly as a rule. Chloral, sulphonal, or barbitone is better. Where active delirium is present, paraldehyde may be tried. The preparation known as 'bromidia' has acted well in my experience in all cases of sepsis, puerperal and otherwise.

It usually suffices if the bowels are opened every other day, and an enema is the most useful way of achieving this. Sometimes at the outset a good dose of castor oil is given with advantage. In bad cases diarrhœa is common, and is of bad import. It is difficult to check. Opium is the most likely drug to succeed.

Nursing.—The nursing of a case of puerperal fever plays an important part in the treatment. The patient should be elevated in the bed to promote drainage from the uterus. The best method of retaining this position is to sew a piece of bandage to each end of a bolster, which is then placed under the thighs just below the buttocks, and fixed so by attaching the free ends of the pieces of bandage to the posts of the bed-head.

The vagina should be irrigated every four or six hours with a weak antiseptic solution such as lysol 1 drachm to 2 pints, and the vulva should be swabbed with the same every time the pad is changed. In doing these things the nurse must be careful to avoid giving pain if septic lacerations are present. Such are best treated by frequent boric acid fomentations.

The skin of the back will require careful attention, especially in those cases where diarrhœa or incontinence of urine is present.

The tongue and mouth soon become dry, and oral sepsis is very common. For this reason the mouth must be frequently cleaned with glycothymoline, listerine, or any other similar mouth-wash.

If femoral thrombophlebitis is present, the leg must be elevated on a cushion and every effort made to prevent the patient moving it. If much pain is complained of, it may be painted with glycerin and belladonna, and wrapped in cotton-wool, or it may be fomented.

In some cases there is much abdominal pain. Boric acid fomentations are then indicated every three or four hours. With peritonitis, flatulent distention may be distressing; it is best relieved by rectal 'wash-outs' thus administered: Half an ounce of turpentine is stirred into a pint of soap and water. A long rubber rectal tube is then passed twelve inches into the bowel. To its outer end a glass funnel is attached, and this being elevated, from 6 to 10 oz. of the solution are allowed to run slowly into the bowel. After remaining in for a few minutes, the funnel end of the tube is depressed and the solution allowed to run out again, aspirating the flatus from the bowel as it does so. The proceeding is then repeated till the solution originally made is used up.

The nurse will have to administer enemata every other day if constipation is present and the state of the patient does not warrant a purgative. If diarrhœa sets in, great cleanliness must be observed, and the skin round the anus should be protected by vaseline.

In very bad cases retention of urine, or retention with incontinent overflow, occurs. The nurse should carefully observe the amount of urine passed and the appearance of the abdomen, in order to guard against the latter happening.

If it is necessary to catheterize the patient, the very greatest care must be taken not to introduce septic organisms into the bladder from the vaginal discharge.

In some cases with extensive perineal laceration, acute inflammation of pre-existing hæmorrhoids occurs, causing great distress to the patient. This is best treated by painting with a 10 per cent solution of cocaine and then applying boric acid fomentations.

In performing all offices which involve touching the patient's genitals or anything connected therewith, the nurse cannot be impressed too strongly with the advisability of preserving her own hands from infection. She should wear boiled rubber gloves on these occasions, if they are obtainable, and if not, should most carefully wash and sterilize her hands after each time of attending to the patient.

Diet.—Provided that it is nutritious and retained by the patient without discomfort, as much food as possible should be given. The maintenance of the patient's strength is sometimes the only consideration of the case, for where both operative measures and specific therapy fail, the only hope is in the personal resistance of the sufferer.

The diet should be liquid, and given at short intervals. Milk, eggs, beef-tea, meat extracts, malted foods, and such like, are all useful.

Where the patient cannot be induced to take food by the mouth, rectal feeding must be adopted. In this case predigested absorbable nutriment is required. The use of rectal saline injections at regular intervals is sufficient to keep a patient alive for many days.

Attendance on other Cases.—Although conveyance of infection from one patient to another is entirely preventable by the use of rubber gloves, strict cleanliness, and sterilization of all instruments and appliances, yet the practitioner who is unfortunate enough to have a case of puerperal sepsis on his list would be well advised to temporarily desist from attending other labours. For it is to be remembered that should a second case become septic, the blame is likely to be laid on him, however unreasonably. Moreover, he himself may be unable to dismiss from his mind the possibility of his having been the agent of the disaster, and thus both his reputation and his peace of mind may suffer. (*See also* Septicæmia.)

Victor Bonney.

PULMONARY ABSCESS.—This condition is unfortunately but seldom amenable to direct surgical treatment, owing to the great difficulty in satisfactorily localizing the abscess. In a few cases, however, where an abscess happens to be near the surface of the lung, and its site has been successfully determined by means of the exploring needle, the cavity may be drained through an opening made in the chest wall, by resection of portions of one or more ribs, as in the operation for empyema (q.v.).

F. J. Steward.

PULMONARY CONGESTION.—(*See* Congestion, Pulmonary.)

PULMONARY TUBERCULOSIS.—In undertaking the treatment of pulmonary tuberculosis, three considerations must especially be kept in view.

1. *The great Curability of the Disease in its Earlier Stages.*

Success in treatment is proportionate to earliness of diagnosis.

2. *The Constitutional Nature of the Disorder.*

Although the disease has a local seat, the significance of the local process is small compared with that of the constitutional disturbance which is speedily superadded. In invading the lung tissue, the tubercle bacillus interferes with the function of the lungs, and may lead to a variety of local accidents of varying degrees of gravity. But of still greater importance are the constitutional effects which are traceable to the influence of the bacillus and the toxins which it elaborates.

3. *The extreme Variability of Clinical Type.*

Cases differ much in clinical features, from the very early type with a limited local lesion, and little, if any, constitutional prejudice, to the hectic type—whether with much or little local lesion—with wasted frame, intractable, swinging temperature, and hardly countable pulse. There is an infinite variety of progress, from the galloping type where death may occur in the course of a few weeks, to the sluggish fibrous type where the patient may show little change for many years. Then there are groups of cases liable to special accident, notably those with recurrent hæmoptysis.

It is clear that, in the application of the principles and rules which follow, much judgement is necessary. It is impossible to formulate a uniform line of treatment. Each case must be judged on its own merits. The determination, by physical signs or by bacteriological examination, that the lungs are affected, is only the first step to the completer diagnosis of the extent and special character of the involvement, both constitutional and local.

In most cases, it is wise to explain to the patient the nature of the disorder, and its curability when taken in hand sufficiently early and thoroughly. Thereby, from the first the co-operation of the patient is likely to be obtained, and all occasion removed for the statement frequently enough heard in the later stages, "If only I had been told in time". Recovery, even in early conditions, depends much on the patient's intelligent appreciation of what is needed.

Manifestly, for a considerable number of patients of excellent constitution, with only slight disturbance of an apex, the rigid discipline which is necessary for those with more widespread disorder may be much relaxed. Such relaxation will be possible in proportion as the patient appreciates the significance of the hygienic principles which govern successful treatment of all cases. Thus, in the case of a schoolchild slightly affected, the chief indications for treatment may be realized sufficiently if the patient be removed from school and allowed for a year or two, perhaps, to run wild, under suitable surveillance, in some country place, education in the ordinary sense taking a back seat, or education may be maintained at an open-air school. So, in the case of young adults affected in the course of a sedentary life, it may be sufficient to explain the nature of the disorder, the principles on which a natural cure depends, and the necessity for a changed mode of life. Such patients, while requiring wise direction for varying periods, according to the principles to be discussed, may not need the strict application of every detail.

It is another matter when the disease has got a more definite hold. In this case the treatment cannot be too careful and systematic. The patient must now be freed from all cares of work, and from social and even domestic ties. He should know that it is a hand-to-hand struggle in which he is engaged, and be made to realize that the programme of treatment is one which, to be effective, may involve much time, and perhaps sacrifice.

After an effective arrest has been attained, the patient should be thoroughly imbued with the notion that, in order to maintain health, he must be prepared to carry out, more or less fully, for the rest of his life, the physiological principles which have ensured his recovery.

From the point of view of both pathogenesis and treatment, it is convenient to distinguish between—(1) The Soil, (2) The Seed.

1. *The Soil.*—The liability to tuberculosis is not the same in all individuals or tissues. Certain individuals and families present a proneness, or at least a diminished resistance, to invasion by the tubercle bacillus. Such a diminished resistance may either be a more or less permanent attribute of the tissues in a given individual, or may be the expression of a transient condition resulting from precedent illness or other devitalizing influence. It must be the aim of all sound treatment to place tissue resistance to tuberculous invasion on as high a level as possible. In this way we oppose the tubercle bacillus by rendering the soil as unsuitable as possible for its growth.

2. *The Seed.*—Direct attack on the tubercle bacillus within the body is less easy and effective than similar attempts on the bacillus *in vitro*. Within the body, consideration must be had, not only to the bacillus itself, but to the anatomical and physiological resultants of its life history.

The aim of rational treatment of pulmonary tuberculosis may be conveniently formulated as follows: (*A*) *To increase the natural resistance of the tissues.* (*B*) *To oppose the tubercle bacillus more directly.* (*C*) *To meet symptoms and complications.*

A.—TO INCREASE THE NATURAL RESISTANCE OF THE TISSUES.

This is the sound order of approach. Nature cures tuberculosis daily without the help of the doctor. Pathological statistics afford abundant proof of this. More than 50 per cent of all dead bodies show definite trace of tuberculosis. Nägeli puts the percentage as high as 97. In a large proportion, the tuberculous lesion is found to be cured. Such natural cures are frequently hindered by the prescription of unphysiological methods. The physician must be content to be an auxiliary of nature. He must remove obstacles as far as possible, and aid the natural tendency towards cure by every means in his power.

All prejudicial influences in the patient's life must be removed. The unphysiological must be replaced by the physiological. There must be a simple, trustful return to nature. The methods are few, and easy of application, provided there be a proper understanding of the *motif*. If this be rightly apprehended, the essentials can be attained anywhere. They comprise:—

1. **Open Air and Sunlight.**—This is the foundation on which all other procedure should rest. In proportion as this is sufficient, everything else becomes easier.

The patient should be bathed in fresh air throughout the whole twenty-four hours. Apart from complications which may require special treatment, this cannot be too complete. Experience, prolonged through many years in the treatment of very many patients in all stages of the disease, thoroughly justifies the statement that the fullest exposure of tuberculous patients to such influence, by day and night, is free from risk and followed by striking benefit in almost every case.

This applies both to pyretic and apyretic cases, and none the less to patients with

bronchitic and pleuritic disturbance. It is a mistake, in presence of increased pyrexia or the signs of bronchitis or pleurisy, to limit the amount of exposure to the open air. Nor must it be lessened by reason of changeable weather. It is equally safe, if perhaps less certainly serviceable and pleasant, during rain and mist. In the denser fogs it is possible to screen the patient from smuts and other aerial impurities by means of a fine veil of gauze stretched over the widely-opened windows.

Where convenient, the patient is best outside entirely, resting either on a couch or reclining chair or other seat, for varying periods according to the stage of the illness. Chilling of the extremities can readily be obviated by suitable clothing and shelter. Where there is a garden, more formal *shelters* can readily be arranged. These should be shallow from front to back, say 4 ft. 6 in. They should be shelters, *not* rooms. The roof should slope from the back forwards and upwards, *not* downwards, so as to avoid the production of a *cul de sac* in the roof, where foul air would collect. The roof, which should be provided with some means of ventilation, and the sides of the shelter, are conveniently made of glass. Many of the shelters seen in sanatoriums, and advertised commercially, are faulty in one or other of these respects. The shelters may either be fixed—when two or three may be necessary facing different directions—or they may be rotary. Simple folding screens, adjustable to any angle, may be attached to corners of buildings or elsewhere.

Open-air treatment is not to be used in summer only. It is a method for all seasons. Indeed, the writer's experience is that, even in northern climates, the treatment is, as a rule, more efficacious during the colder than during the warmer months of the year. At such times it is, of course, essential that due attention be given to the peripheral circulation. This is readily maintained by a sufficiency of woollen garments and warm wraps.

Although, for many reasons, it may be desirable to have patients indoors by night, there can be no doubt that the treatment is beneficially maintained during sleep. A large proportion of the writer's hospital patients sleep in open shelters ; and this by preference. There is usually keen desire among the patients to be placed on the list of outside sleepers, no less in winter than in summer.

When, for any reason, it is necessary to keep the patient indoors, the room should be as fresh and free of furniture, carpet, and hangings as possible. The patient's bed should be close to the window, which should be made to open, and be kept open, as freely as possible. In dusty neighbourhoods—in the case of private houses—and in the presence of fog, the patient may be protected from noxious influence by the thin gauze screen already mentioned. The nonsense that used to be talked about draughts may be discounted if only the inlet of fresh air be rendered sufficient.

2. **Dietary.**—Loss of appetite and digestive disability are common complaints of the tuberculous patient at one or other stage. They are especially frequent in patients treated indoors on protective lines. Nothing is more remarkable than the rapidity with which healthy appetite and natural digestion return when the patient is transferred, so to speak, from the hothouse to the garden. Often the appetite becomes voracious. There is little call for forced feeding. The patient eats of his own accord. It is sometimes helpful to serve meals in the open air. With the disappearance of digestive troubles, and the return of a normal appetite, the quantity of food may be increased. To avert a tendency to sickness, which some patients manifest to an extraordinary degree, it is well, not only to insist on prolonged rest before and after meals, but to feed the patient reclining.

The number and constitution of the meals must vary with the state of the patient. As to number, in most instances three meals of approximately equal value are sufficient and best. Thereby nutrition is ample, and the stomach is adequately rested between meals. This tends to the restoration of natural secretions, and activity of stomach and bowels.

The meals may be arranged as follows : Say breakfast at 9 a.m., luncheon 1.30 p.m., and dinner 7 p.m. In some cases it is advantageous to allow a slight snack on waking, say at 7 a.m., e.g., a little rum and milk, or a cup of tea and toast, and again, say, at 4 p.m. In most cases nothing should be allowed between meals or after dinner. The patient usually sleeps better on an empty stomach. If, for any reason, something is desirable at bedtime, or through the night, a cup of thin meat tea, or diluted hot milk, may be allowed. The treatment of digestive disabilities will be considered later on.

If the patient manages the three meals well, they may be varied to please his palate, provided they include a sufficiency of nitrogenous food, fats, and carbohydrates. Much

may be achieved by skill in cooking, and daintiness in serving, the various dishes. In this way the kitchen replaces the dispensary.

The following may be taken as a suitable, comprehensive menu from which selections may be made from day to day.

Breakfast may include porridge (preferably made with half milk, and boiled for forty-five minutes), cream, milk, toasted stale bread, butter, eggs, mild bacon, well-hung underdone meat, raw meat in various forms, fish of different kinds, and tea, coffee, or chocolate, well diluted with milk.

Luncheon may include a cup of soup (to which may be added, just before serving, a varying quantity of raw meat pounded), fish with simple butter sauce, well-hung underdone steak, roast beef or other meat, chicken, game, vegetables (e.g., potatoes, onions, spinach, peas, beans, lentils, etc.), farinaceous puddings, stewed fruit, cream, butter, cheese, and a glass or more of milk.

Dinner should be similar to luncheon, advantageously on the lighter side.

The question of *stimulants* must be decided in the individual case. Guides as to their use are the pulse, temperature, and the patient's custom. Many apyretic patients with satisfactory pulse are better without stimulants at all. On the other hand, stimulants are often serviceable, more especially in patients with feeble circulation and irregular temperature. They help to pick up a flagging appetite, and aid digestion. Under their use, tendency to flatulence and other gastro-intestinal discomfort is lessened.

The *form* of stimulant is similarly various, and depends in part on the taste of the patient. Most frequently whisky (one or two tablespoonfuls added to a tumblerful of milk) is best. To other patients, an equivalent quantity of alcohol may be given in the form of sound wine (hock, moselle, burgundy, sherry, port, champagne, according to circumstances). Others prefer, and benefit by, an equivalent quantity of beer or stout.

Where such a regimen is accompanied by digestive disturbance—more particularly in patients whose nutrition is much disturbed—the diet is simplified with advantage.

It may then consist chiefly of raw meat—*zomotherapy*. The systematic exhibition of raw meat is a therapeutic as well as a dietetic procedure. Form and dosage require to be regulated as we regulate the exhibition of other therapeutic agents. It has been shown conclusively in the case of dogs inoculated artificially with tuberculosis, that such animals when fed in the ordinary way undergo progressive emaciation, while those fed on raw meat put on weight more or less rapidly. To be efficacious, the doses of raw meat must be sufficient in proportion to the weight of the animal. Under these conditions, raw-meat treatment is effective even when the animals seem *in extremis*. Cooked meat has been found of no value in the case of tuberculous dogs. Zomotherapy is thus something more than a question of extra feeding. When systematically pursued, there follow increase of nitrogen retention, improvement in intestinal metabolism, an increase in hæmoglobin, and a striking increase in digestive leucocytosis (lymphocytosis).

Raw meat may be exhibited in several ways: (*a*) Pounded raw meat, i.e., finely minced or bruised fresh beef (mutton may be used, it preferred), seasoned with salt, etc., according to taste, served *natural*, like mince collops, cold or gently warmed throughout, say ½ lb. twice or thrice daily. The meat may be served with salad, or along with aspic jelly, or in a variety of other ways. (*b*) Beef-juice prepared as follows: Extract ½ lb. of meat in ½ pint of cold water, plus ½ teaspoonful of salt, for 1½ to 2 hours at 100° F. Express the liquid through a cloth, and serve. Or, the juice may be squeezed from the meat directly by more powerful pressure, without the addition of water. Worcester sauce or other flavouring agent may be added. (*c*) Raw meat soup, prepared as follows: Take ½ lb. finely minced meat and mix in a bowl with sufficient milk to produce a thick, uniform paste. Immediately before serving, add ½ pint of milk at 150°. In place of milk, the soup may be made in similar fashion with stock of beef, chicken, veal, or mutton.

In all cases the meat should be *as fresh as possible*. Meat juice especially must be freshly prepared *immediately before use*. Prepared juice speedily undergoes changes which both detract from its value and tend to irritate the gastro-intestinal tract.

In the same dietetic category may be included raw eggs. The patient's meals may be prefaced with one, two, or three eggs—*nature*—swallowed like oysters. The eggs should be quite fresh, i.e., newly laid. They should not be switched or mixed with milk, or other

ingredients, apart from a sprinkling of pepper or salt. In cold weather the chill is better taken off all raw preparations by *gentle* exposure to warmth just before use.

Short of exclusive zomotherapy, it is frequently well to limit the patient to a dietary of raw and underdone meat, butter, toasted bread, and milk, with perhaps a little stimulant, avoiding much vegetable or farinaceous food. Thus, breakfast may consist of raw meat rissoles, toast and butter, and a glass of warm milk slightly diluted, to which, in some cases, a tablespoonful of rum has been added ; lunch and dinner of raw meat juice, and lightly grilled minced beef or tender steak, butter, toast, stewed fruit, and a glass of milk as above, or a little light wine. Such a dietary sometimes starts healthy nutrition as nothing else will. It may be necessary to maintain such a dietary for weeks. As the condition improves, a more varied menu may be again sanctioned.

The use of *milk* to some extent is commonly advantageous. The amount to be ordered is not the same in all cases. The determination of the *optimum* quantity requires considerable discrimination.

If the patient can take full ordinary dietary, there is no need to push milk further than already indicated. Excess is apt to disturb stomach and bowels. Where, however, the patient cannot manage a varied dietary, the amount of milk may be increased. When taken solely, or chiefly, 3 to 4 pints may be allowed in twenty-four hours. Where any possible doubt exists as to the purity of the supply, the milk should be sterilized.

Where there is definite irritability or disease of the gastro-intestinal tract, a more rigid dietary is sometimes indicated. Thus, a milk dietary may be made to alternate, at varying intervals, with raw-meat feeding. The milk may be given in different forms according to the needs of the patient. In most cases it is advantageously diluted with barley-water, soda- or lime-water, or sound buttermilk, according to circumstances. It may be combined with eggs, or tea, coffee, cocoa, or alcohol in some form. Or again, it may be fermented, as in koumiss or kefir ; or be peptonized. In critical cases, where assimilation is feeble, there is need for patience and skill in the selection and apportionment of these from day to day.

3. **Rest.**—Discrimination is required in the determination of the amount of rest. In dealing with most patients for the first time, it is well to maintain rest until the condition is fully known.

The best index from day to day as to the amount of rest is to be found in the pulse and temperature. In proportion as the temperature continues to swing and the pulse remains rapid and soft, the patient should rest chiefly or entirely. It is a handy enough rule to insist on complete rest when the temperature tends to rise above 100°, or when the pulse beats *constantly* more than 90 per minute.

As the temperature and pulse improve, the rest should be made less absolute. The amount of movement should, however, be carefully detailed to the patient. Thus, he may be allowed ten or fifteen minutes' slow walking every hour or two, resting for the remainder. With a continuance of improvement, the periods of activity may be lengthened, and perhaps combined, so that the patient may walk for three-quarters of an hour to two hours in the forenoon, and perhaps for a similar period in the afternoon, resting between times. In most cases, rest for half to three-quarters of an hour should be insisted on before and after meals. The effect of movement will be carefully gauged by the pulse and temperature. If these are disturbed to any marked extent, the amount of activity should be readjusted accordingly. By way of variety, when his strength permits, the patient may be allowed carriage or gentle motor riding, care being taken to avoid dusty roads and undue effort.

4. **Activity.**—If the pulse and temperature are not disturbed—and they are often conspicuously benefited—by regulated movement, the periods of activity may be advantageously increased.

As to the kind of exercise, walking is most suitable in the majority of instances. It should at first be slow, say at the rate of two to three miles an hour. The patient should not talk, and all hurry must be excluded. It should be practised at first on the level. With increase of strength, slight inclines may be faced, and still later, more definite hill climbing may prove advantageous. When the patient has been sufficiently tested, mild golfing exercise may be allowed. The interest of the game, and the swing of the club, if not too violent, are distinctly helpful. By this time, horseback exercise may be

permissible, and, in some cases, *easy* cycling. The patient must, of course, be warned against over-fatigue and chill. More rapid activity, such as tennis, hockey, and the like, are less desirable, and should be sanctioned in exceptional cases *only*.

Respiratory exercises are helpful. These should be simple, and practised in the open-air, or at least at the widely-opened window. The patient should be taught to respire slowly, through the nose—not the mouth. The value of the diaphragm should be enforced. Both inspiration and expiration should be slow and full. With persistent practice for a few minutes daily, the respiratory capacity may be remarkably increased. The patient's carriage should be as erect as possible. This is specially important in growing children. It may be helped, and faulty chest architecture remedied, by carrying a stick behind the back in front of the folded elbows, which may be brought together behind by straps. Simple movements of the arms backwards, and upwards and backwards, and so on, are also helpful. All such movements, to be effective, must be slow, in correspondence with a slow rate of respiration. If dumb-bells, Indian clubs, or other apparatus be used, the weight should be light and the movements slow.

Such physical treatment is an important element in the regimen of the consumptive. It should be arranged in graduated stages. Thus, at the Royal Victoria Hospital for Consumption, Edinburgh, the regimen has been somewhat as follows.

Three stages are recognized: (*a*) Resting stage; (*b*) Stage of regulated exercises; (3) Stage of graduated work. Each patient begins at the first stage, and is gradually advanced through the other stages, according to his physical condition. The nature and amount of activity are prescribed just like drug treatment. The dose is increased or diminished as the temperature chart, pulse-rate, and other indications suggest.

a. Resting Stage.—On admission, all patients are enjoined complete rest, lasting from a few days to several weeks according to the case.

b. Stage of Regulated Exercises.—This includes (i) Walking from $\frac{1}{4}$ to 5 miles, (*a*) on the level, (*b*) on sloping ground. (ii) Various respiratory exercises. (iii) Other forms of movements to improve shape of chest, carriage, etc.

c. Stage of Graduated Work.—The work may be chosen with a view to utility, with due regard to the patient's inclination, his past occupation, etc. This stage is subdivided into four grades: Grade *A*, including, e.g., collecting light rubbish from grounds, etc. Grade *B*, e.g., carrying light baskets for various gardening purposes. Grade *C*, e.g., raking, hoeing, mowing. Grade *D*, digging, sawing, wheeling full barrow, etc. In the last three grades patients may be allowed to make their own beds and do a number of minor domestic matters for themselves. The result of treatment will be traceable in the increasing tonus of the muscles.

5. **Clothing and Skin Hygiene.**—The functions of the skin in respect of heat regulation and excretion must be looked to. While the patient should be kept sufficiently warm, he should not be overclothed. Most patients err much on the side of overclothing. I have known of twenty-three layers between the skin and the air. Excessive clothing seriously interferes with the skin as a heat regulator.

Woollen garments are, as a rule, best. A knitted undersuit, or combination, with a single flannel shirt or its equivalent, is usually sufficient under the outer clothing. The texture should be as light and loose as is compatible with sufficient warmth. Chest protectors, flannel bandages, rolls of cotton wadding, and the like, should be forbidden. Corsets are better absent. In the same way, bedclothing should be on the light side. The patient, while sufficiently warm, ought not to be overheated in bed. The bedstead should be as open as possible. Curtains and hangings should be forbidden.

Water may be used to the skin freely. In most cases this will be advantageously attained by a morning dip into tepid, cool, or cold water, according to circumstances. Other things being equal, the cooler the water and the more rapid the bath, the better from the therapeutic point of view. Where the patient is confined to bed or couch rapid sponging, followed by dry rubbing, will be sufficient. Even for such cases, sometimes a rapid dip into a long bath is more satisfactory. Generally it is better to arrange for a nurse or other assistant to be in attendance to rub the patient. Rapid improvement frequently follows the institution of a regular daily bath.

6. **Drug Treatment.**—There should not be too much of this. For the purpose of increasing tissue resistance, and repairing loss and generally improving tone, certain drugs

and other agents are serviceable. In the first place, especially when an insufficient amount of butter and ordinary animal fat is taken at meal times, oils are helpful. Of these, perhaps the most generally available and satisfactory is cod-liver oil. It may be exhibited pure, or emulsified in a variety of ways. The form is pretty much a matter of palate. As to dosage, this varies from 1 to 4 drachms twice or thrice daily. Patients on open-air lines take cod-liver oil more readily, and tolerate it better, than do others. Sodium morrhuate (3 per cent) has been given subcutaneously and intravenously, every second or third day, commencing with 0·5 c.c. and gradually increasing. Butter, cream, and other animal fats serve a similar purpose. The patient may tolerate and even enjoy such fats, when he rebels against cod-liver oil. In this case, certainly let him have what he prefers.

Various other oils, notably preparations of petroleum, have been proposed as substitutes for cod-liver oil. It has been shown, however, that little, if any, of such oil is absorbed from the gastro-intestinal tract. Although not absorbed, those oils are not without value as scavengers and cleansers of the digestive tract, thereby rendering intestinal metabolism healthier.

Malt preparations are undoubtedly of service. They may be given by themselves, or conveniently in combination with cod-liver oil. There are several good preparations of the sort available. Hypophosphites of calcium, potassium, and sodium have tonic value. They may likewise be given in combination with one or both of the above. The syrupus hypophosphitum compositus B.P.C. 1 to 2 drachms is a serviceable preparation. It contains hypophosphites of calcium, manganese, potassium, iron, and quinine.

Arsenic, in one or other form, is a drug of much value in the early stages, particularly in young subjects. To be effective, it must be continued *for a considerable length of time, that is, weeks or months*. During its prolonged use, an occasional interruption for a week or ten days is wise. As to form, it is conveniently exhibited as liquor arsenicalis (say 1 to 5 min. thrice daily), or arsenious acid (say $\frac{1}{60}$ to $\frac{1}{12}$ gr.), or cacodylate of sodium ($\frac{1}{2}$ to 1 gr.). Some have maintained that special advantage results from the subcutaneous or intravenous use of arsenic, more particularly in the form of cacodylate of sodium. While the writer is convinced of the value of the prolonged exhibition of arsenic, especially in early cases, he has been unable to trace any special advantage from subcutaneous injection. In more dilute form, arsenic may be given conveniently in La Bourboule water, say half a tumbler, thrice daily. This is taken with advantage immediately before meals. The special efficacy of arsenic seems to lie in its influence over the blood-forming mechanism. Not only is secondary anæmia lessened, but tissue resistance is increased. It may be that arsenic has a more direct, bacillicidal influence. Glycerin appears likewise to be of some value. It may at least be conveniently added to various tonic mixtures.

Sanatoriums.—Sanatoriums are now available in most countries for the special treatment of tuberculosis. It is of course unnecessary to send all patients to such institutions. Most of the measures which have been already indicated can be carried out in reasonably well-equipped private dwellings, provided the doctor realizes what is necessary and can get the assistance of a suitably trained nurse, and can persuade the friends to carry out the system rigidly.

It is usually easier to attain what is wanted in a sanatorium. For a good many cases it is helpful if the patient live for a time, at least, in a sanatorium, so that he may become acquainted with the system which he will have to follow for a long period. He is there taken thoroughly in hand. Strict regularity is introduced into his life, and slight aberrations from the path of recovery are quickly noticed. With more thorough training of doctors and better education of nurses and persons generally regarding the physiological principles of treatment, sanatoriums will become less and less necessary.

In selecting a sanatorium, it is efficiency and thoroughness of régime which should be sought, rather than climatic or other of the much advertised advantages. There are not a few risks in connection with the commercial and social side of sanatoriums, which unfortunately are likely to grow rather than to diminish. What is especially desirable is the close personal supervision of a physician who has a wide experience of tuberculosis in its extremely varying manifestations. Other things being equal, a smaller sanatorium, where each patient is directly under the care of the physician-in-chief, is better than very large institutions.

Climate.—Formerly, climate played the chief part in treatment. This was largely owing to the belief that pulmonary tuberculosis resulted from a neglected cold, and that such colds were more likely to occur and continue in certain countries. More recent observations have proved that the disease is not materially influenced, either in origin or course, by climate as such. It has been conclusively shown that the disease occurs in all climates, at all latitudes, and at most elevations. Certain climates are better than others by reason of their comparative sunniness, dryness, equableness, and other qualities. After all, the best climate is undoubtedly that which brings patients most into the open air, and frees them from the prejudicial system of protection. The cure of tuberculosis may be successfully carried out in all ordinary climates, provided the air be pure, the physiological regimen realizable, and a sufficiently early diagnosis has been made.

While this is true, it is none the less certain that change of climate, if it can be effected with sufficient comfort, does exercise a helpful influence in many instances. This influence is frequently wanting, or rather is entirely neutralized by the absence of other hygienic requirements. Many hotels and so-called sanatoriums at climatic resorts are anything but satisfactory. It should also be remembered that there is a growing objection to receiving tuberculous patients into ordinary hotels and apartments.

It must also be kept in view that in sending a patient to another climate there is necessarily a large expenditure, both of physical energy and of means. This expenditure may be in excess of the patient's resources in one or other direction. In either instance, his condition is apt to be injured rather than benefited by the strain. It is wrong to send him far afield if he is not in a fit state to stand fatigue, the possible discomforts of hotel life, and the absence of home attention. It is no less a mistake to allow him to go far from home if he has to economize at every turn.

In deciding the question of sending a patient away, a good rule to keep in view is that the more advanced the disease the less likely is the patient to benefit from the transference. It is patients in the early stage of the disease who may be expected to do well. It is not advisable to let pyrexic patients undertake long journeys. If complications are present, it is generally best to be content with treatment nearer home. All patients in the more advanced stages, and all dying persons, should be kept at home. It is an egregious sin to sanction risk and inconvenience at such a time.

Selection of Climate.—The selection of a climatic resort depends a good deal on the patient's taste and disposition, no less than on his actual condition. There is probably less virtue in the actual climate than was at one time supposed. The most important point to be determined is that, in the selected climate, really suitable conditions of residence and life can be obtained.

For working purposes, climates may be roughly grouped as follows :—

1. *Sea-coast Climates, including Sea Voyages.*—The advantages are pure air frequently in movement, ozone, maximum of sunlight, relatively equable temperature, and comparative warmth in relation to latitude. Disadvantages are wind—often boisterous, which disturbs many patients, upsetting their nervous system—clouds of sand, and moisture. Such climates are probably protective rather than curative. Patients sleep well usually and there is a whetting of appetite. On the other hand, some patients suffer much from the irritation referred to, and constipation and other gastro-intestinal discomforts are common. As a rule, patients with pulmonary tuberculosis do better away from the sea. This group (of seaside resorts) may be sanctioned in chronic cases, more especially when complicated by catarrhal tendency or albuminuria. They are particularly serviceable in children with glandular, osseous, or articular disturbances. Examples are found along the south and south-west coasts of England, at Forres and Nairn in Scotland, along the south-west coast of France (Arcachon, Biarritz), the south-east coast of Spain, the French and Italian Riviera, the Sicilian coast, the north coast of Africa, and in the Canary Islands, Madeira, West Indies, and Florida. In tropical countries, as a rule, coast towns are undesirable, and indeed so is the sea border generally.

A sea voyage has the same kind of advantages, with the absence of sand storms. The great drawback is the insufficient ventilation generally found in both public and private cabins. In proportion as much time has to be spent in these, for one reason or another, the advantages of the voyage are neutralized.

2. *Desert Climates.*—Desert climates enjoy a maximum of sunshine and heat, and the

further advantage of purity and dryness of air. Sand and dust storms are, however, frequent. Desert climates offer the same kind of advantages as do coast climates. They are well adapted for chronic cases, and exert a curative influence on slowly progressive cases. Examples of this type of climate are found in Egypt (Helouan, Luxor, Assouan) and Algeria (Biskra).

3. *Forest and Woodland Climates at Relatively Slight Elevation* (*say* 150 *to* 1500 *feet*). These may be found in almost any country and are correspondingly convenient. The character of these, in respect of dryness, warmth, and suitability generally, necessarily varies with the latitude, distance from seaboard, and nature of country. They have more or less the advantage of purity of air, absence of dust, and, where trees are present, shelter from wind, and sweetness, even fragrance, of atmosphere (pine woods). Such resorts are favourable for most cases, even acute progressive conditions. Provided the stay be long enough, and other physiological indications are fulfilled, patients generally do well. Numerous examples might be cited from the Highlands of Britain and Ireland, Switzerland, the Black Forest, France (Pau), Austria (Tyrol, Dolomites), and the Italian lakes.

4. *Mountain Climates* (*say* 1500 *to* 10,000 *feet or more*).—The advantages are great purity, rarity, dryness, and coolness of atmosphere, brilliance and warmth of the sun's rays, and, in many cases, extreme stillness. These properties differ considerably according to elevation. In varying degree, they stimulate respiration, circulation, and blood formation, improve appetite and digestion, and promote healthy activity of skin. The higher elevations have the disadvantage sometimes of over-stimulation, with resultant sleeplessness and other irritation. Such resorts are generally suitable for most cases, even those far advanced. It is, of course, unwise to transfer patients to such altered conditions during acuter manifestations. Probably cases with albuminuria or tuberculous enteritis are better elsewhere. In selecting a mountain climate, regard must be had to the fact that often food supplies are less abundant and less satisfactory than is desirable. This is specially true of some places in South Africa, where neither food nor accommodation is very good, and where the dust storms during dry weather are trying. Such resorts are not available in the United Kingdom. Examples may be found in Switzerland—Leysin (4757 feet), Montana-sur-Sierre (5050), Davos Platz (5115), Arosa (6035), St. Moritz (6090); in South Africa—Beaufort West (2800), Cradock (3000), Middleburg (4200), Aliwal N. (4350), Bloemfontein (4500), Pretoria (4500), and Harrismith (5280); in New South Wales—the Blue Mountains; in North America—the Rocky Mountains, Denver (5196), Colorado Springs (5992); and in South America, the Andes.

B.—TO OPPOSE THE TUBERCLE BACILLUS MORE DIRECTLY.

This is the sphere of specific treatment, and especially of *Tuberculin*. From the experimental side, many attempts have been made in this direction, with varying results. On the clinical side, the results are encouraging, if less uniformly successful than might be desired. Lack of success is frequently due to lack of patience, on the part both of doctor and of patient, and to lack of sufficient experience. There has been want of exactness in the selection of suitable cases, and a hasty, sometimes reckless, employment of the remedy.

It is important to determine whether the tuberculous lesion is chiefly local, or whether systemic involvement is also great. In proportion as *the disease is localized and the systemic disturbance is relatively slight*, tuberculin is likely to be of service. The defensive mechanism must be capable of ready response. If, contrariwise, the system is already saturated with tuberculous toxins, the exhibition of tuberculin may serve to aggravate the condition. It is in the selection of suitable cases, the exact proportioning of the initial dose, and the rate of increase of dosage, that experience and judgement are required.

The Tuberculins.—Since Koch's earliest announcement in 1890 various modifications and refinements have been proposed. The several recognized tuberculins possess specific properties. They have certain features in common, and also present certain differences. The features in common is their relationship to the tubercle bacillus. The differences are dependent on their source and method of extraction: (*a*) Whether of human or bovine origin; (*b*) Whether they constitute chiefly an extract from the culture medium, in which case exotoxins are especially present, or an extract from the bacilli

themselves, in which case endotoxins are especially present. Some tuberculins combine both exotoxins and endotoxins.

For convenience of reference, the tuberculins which at present are chiefly used may be grouped as follows :—

1. Containing Exotoxins.—

Koch's Old Tuberculin, T, or, if of bovine origin, PT : a glycerin extract obtained from recent, six to eight weeks' old, broth cultures of tubercle bacilli, and concentrated by evaporation to one-tenth of its volume. Initial dose, for an ordinary case with local lesion in excess, may be stated at 0·00001 c.c., diluted with normal saline solution or ½ per cent carbolic acid.

Tuberculin TO, or, if of bovine origin, PTO : Essentially the same as the former, with the difference that the extract is not evaporated. This is a milder preparation, and has a special value on that account. Initial dose, for an ordinary case, may be stated at 0·0001 c.c.

Denys' Tuberculin : A simple filtrate obtained by passing tubercle cultures through porcelain. Initial dose similar to that of *PTO*.

2. Containing Endotoxins.—

Tuberculin TR : An extract obtained from recent cultures dried *in vacuo* and pounded in a mortar, the more soluble exotoxins being removed before the extract is made. Initial dose, for an ordinary case, may be stated at 0·00001 c.c.

Tuberculin BE (Bacillary Emulsion) : An emulsion of desiccated, pulverized tubercle bacilli in equal parts of glycerin and water. Initial dose, for an ordinary case, may be stated at 0·00001 c.c.

3. Containing Exotoxins and Endotoxins in Combination.—

Béraneck's Tuberculin, T Bk : Containing (*a*) Exotoxins obtained from a culture of tubercle bacilli on a special peptone-free medium ; (*b*) Endotoxins extracted from the bodies of bacilli by orthophosphoric acid (1 per cent). This tuberculin, while highly potent, is, in the writer's experience, less toxic than some of the others. Initial dose, for an ordinary case, may be stated at 0·000001 c.c. to 0·00001 c.c.

Regulation of Dosage.—Such initial doses as have been proposed produce in suitable cases a very slight, perhaps hardly traceable, reaction. Within the first twelve to twenty-four hours, the patient may experience slight malaise ; the temperature may show slight perturbation ; the pulse may become more rapid ; the symptoms may become more pronounced (cough, expectoration, etc.), and the physical signs more definite.

The following practical rules may prove of service. Judge each case on its merits throughout. The initial dose will be fixed after a careful estimate of the local lesion and systemic disturbance, and subsequent dosage must be regulated by the effect produced, not by rule of thumb. Fixed scales of dosage are apt to be fallacious, and, if prescribed, should be followed with discrimination according to the effect. Better begin with too small a dose than an excessive one. The object is to reach the *optimum* dose, that is to say, that which affects the patient and the local lesion without disturbing overmuch ; this can only be determined by careful clinical examination from time to time. Watch carefully for evidence of hypersusceptibility (anaphylaxis).

Routine of Method.—In many cases it is sufficient to give a weekly dose. Sometimes in persons of marked susceptibility, the interval between the doses may be wider, e.g. ten days or a fortnight. In other cases a more intensive line may be followed, and the injections may be repeated every third to fifth day. In all cases, *the determination of frequency and amount of dosage must rest on the effects produced systemically and locally*. This implies careful clinical observation from day to day. The endeavour to determine the point by certain blood tests—e.g., by estimation of the opsonic index—has not proved quite satisfactory.

It is a good rule to repeat the same dose once or twice, especially at the commencement, to avoid the fallacy of a missed reaction.

The duration of a course of tuberculin will depend on the case. Under ordinary conditions, it is frequently a matter of six months. A second course may be required. It is practicable to allow an interval of three months between the first and second course. The second course may be a matter of three months, followed by a further pause of three months, and so on.

Advantage is claimed for alternation of different tuberculins. One of the milder preparations may be used first, and this may be followed by one of the more potent. Or an exotoxic variety may be used first, followed by an endotoxic. It is one of the advantages of Béraneck's tuberculin that it combines both exotoxins and endotoxins and yet is mild in action, with little tendency to disturb the patient.

Excessive sensitiveness may show itself unexpectedly when the progress of treatment has seemed satisfactory. A slight increase of dosage over one which has not caused disturbance, or the repetition after due interval of the same dose, may be followed by pronounced reaction. After a further interval, it may be found that even a smaller dose gives rise to disturbing reaction. In such cases it is prudent to increase the intervals and fall back on still smaller doses. By this means the hypersusceptibility is commonly overcome, and a gradual return to larger dosage becomes possible.

Every case does not lend itself to tuberculin treatment. It is especially serviceable in early cases where the local lesion is in excess of systemic disturbance. It is preferably used in the absence of pyrexia. In such cases the results are commonly good, and frequently remarkable. But carelessness in dosage and too frequent repetition may prove unfortunate. A violent reaction may occur, and pyrexia—difficult to restrain—may be induced, with evidence of extension of the local disease.

In pyretic cases the use of tuberculin is not entirely contra-indicated. If sanctioned, the dosage must be considerably less, and the effects checked with discriminating care. In suitable cases, such regulated dosage seems to exert an antithermal influence. In highly pyretic cases it may be wiser to refrain from the use of tuberculin.

Technique.—Any good hypodermic syringe may be used. The essential point is that it can be readily sterilized. This is best done by boiling. The injections are best made deeply under the skin in the interscapular region. The site has several advantages. The outer aspect of the upper arm has the advantage of convenience. The skin is suitably sterilized by means of alcohol, or ether followed by alcohol.

Inunction of Tuberculin.—In some subjects, especially children, tuberculin may be advantageously exhibited in the form of an ointment of varying strength. Moro's ointment (equal parts of old tuberculin and lanolin) is convenient. The application is made over a soft skin surface, say, every third or fourth day. Following the application, in the course of twelve to thirty-six hours, a fine papular eruption commonly appears. The further steps will be guided very much on the lines indicated above.

Serum.—Various attempts have been made to obtain a serum, possessed of immunizing properties, from the blood of animals, themselves rendered immune by means of bacilli or their products. Of these the serum of Maragliano and that of Marmorek are best known. But, while the results justify the continuance of observation and research on this and similar lines, such sera have not yet obtained a therapeutic position of first-class importance. (*See also* SPECIFIC THERAPY.) The same remarks apply to the use of simple horse serum. Similarly *autoserotherapy* has been urged, consisting in the introduction subcutaneously of serous fluid withdrawn, e.g., from the patient's pleural sac. Under the name of heteroserotherapy the practice has been recommended of introducing subcutaneously fluid taken from the pleural sac of other patients. Encouraging results have been cited, but a strong case has not been made for the procedure.

Drugs.—Apart from tuberculin and sera, which derive their specific properties from their relationship to the tubercle bacillus, certain drugs have been credited with a more or less germicidal influence on the tubercle bacillus. The number of these is great. The limits and purpose of the present article admit citation of the chief only.

As to *mode of administration*, practice varies considerably. Rather an over-estimate is sometimes made of the value of certain modes of exhibition. The most natural method is administration by the mouth, whether in solution, emulsion, pill, or other form. Where, for any reason, continuous oral administration is undesirable, e.g., in presence of gastro-intestinal irritation, use may be made of subcutaneous or rectal medication. The disadvantage of either of these is that it is generally desirable to have it carried out by a skilled attendant, which for obvious reasons may not always be possible. Intratracheal injection is also a ready means of continuous medication. It is doubtful if any real advantage is obtained by the use of the respiratory passages for the purpose of *direct* combat, although absorption proceeds readily, as from other mucous surfaces. The intratracheal method

is easy in trained hands, but has the disadvantage that, to be effective, it must be carried out either by a doctor or by a thoroughly trained nurse. Intravenous injection of various drugs has been frequently proposed. It seems likely that all the benefit to be obtained through this channel can be achieved by subcutaneous or intramuscular injection. The value of drugs by inhalation is periodically insisted on by some enthusiastic *re*-discoverer of a method which, while it seems natural and is invitingly easy, has been discarded by most observers. The method has little more than symptomatic value. It plays a more definite rôle in tuberculous laryngitis and in the limitation of mixed infections.

Of germicidal agents, *Creasote*, or one of its congeners, is the most important. Almost all observers are agreed that, if not possessed of specific properties, it exerts a most wholesome influence. It is sometimes objected regarding such drugs, that it is impossible to introduce into the system an amount sufficient to kill the organisms without at the same time gravely damaging the living tissues. In answer to this, it has to be borne in mind that it is not a question of killing the bacillus, but rather of so modifying the conditions of environment as to make these unsuitable, or at least less suitable, for the development of the bacillus. It is further possible that creasote acts by neutralizing some of the products of the bacillus. It may be that its chief activity is in the gastro-intestinal tract, which it puts into better order, thereby improving intestinal metabolism.

In exhibiting creasote orally, care must be taken that it is a *pure* preparation of beechwood creasote. Cruder preparations tend to cause gastric irritation, with resultant dyspeptic phenomena. As to dosage, 2 to 5 min. may be given, gradually increasing to 15 or 20, three times daily. When the larger doses are reached, the kidneys should be carefully watched. The urine tends to become dark as the result of over-dosage. It is conveniently exhibited in capsule form, preferably along with, or after, food. Although less pleasant, it may be given in liquid form, e.g., in wine, or emulsion of cod-liver oil. Carbonate of creasote (creasotal) is said to contain 90 per cent creasote and to be less irritating. It may be given in doses of 5 to 30 min., thrice daily.

Creasote may also be administered hypodermically, dissolved in sterilized oil (5 to 10 per cent), or per rectum as in the following formula :—

℞				
	Creasoti	♏xv–lx	Ovi Vitellum	j
	Olei Olivæ	ʒv	Aquæ Destillatæ	ʒvj

It may be used by cutaneous inunction, as in the unguentum creasoti or the following :—

℞				
	Creasoti	♏lxx	Adipis	
	Lanolini		Olei Olivæ	āā ʒvj

Or it may be exhibited by intratracheal injection, dissolved in oil (10 to 50 per cent). It is doubtful in this, as in all intratracheal injections, how far the agent reaches. There can be no question that by means of intratracheal injection the patient is frequently benefited. Conspicuous symptoms yield, cough and expectoration are lessened, and in many ways he improves. Local tuberculosis of larynx and upper air-passages is certainly helped. It is probable that, so far as the lung lesion is concerned, the drug does not act by immediate contact. But the respiratory passages afford an absorbent surface whence the drug is doubtless carried to different parts, as after absorption from the alimentary tract.

Inhalations of creasote, formerly so much in vogue, are probably of little permanent service. The respirators which used to be worn are positively harmful, as impeding respiration.

Of its congeners, *Guaiacol*, which has the same active principle, is the most important. Its action is essentially the same. It may be prescribed in doses of 2 to 15 min., either in capsule, pill, or in solution.

℞				
	Guaiacol	1 part	Water	180 parts
	Alcohol (90 per cent)	20 parts		

One to three teaspoonfuls twice or thrice daily.

Or the mistura guaiacolis of Guy's Hospital :—

℞				
	Guaiacolis	♏iv	Olei Cinnamomi	♏j
	Alcoholis (90 per cent)	♏xl	Aquæ Destillatæ	q.s. ad ʒj
	Glycerini	♏xxx		

Or it may be given with sherry wine. It is combined pleasantly enough with cod-liver oil.

Or it may be given hypodermically, as in the following :—

℞ Guaiacol 5 parts | Parolein 100 parts
Iodoform 1 part |

Fifteen to thirty minims once or twice daily.

Where the stomach threatens to be troublesome, or where there is difficulty as to the smell or taste, the same influence may be obtained by the use of carbonate of guaiacol (duotal), a white crystalline powder, without taste or smell, which may be given in pill or cachet to the extent of 5 to 25 gr. thrice daily. A good prescription is as follows :—

℞ Guaiacolis Carbonatis gr. iv | Acidi Arseniosi gr. $\frac{1}{60}$

Fiat pilula. One to three pills to be taken thrice daily.

Other derivatives are numerous, but of less importance, e.g., benzoate of guaiacol (benzosol), sparingly soluble (4 to 12 gr. in cachet or powder) ; phosphate of guaiacol and orthosulphoguaiacolate of potassium (thiocol), readily soluble (5 to 30 gr.) ; cinnamate of guaiacol (styracol), hardly soluble in water (15 gr.). The last named has a considerable reputation. It is a white powder without smell, not disagreeable to taste, and free from noxious influence. It may be exhibited in doses of 15 to 30 gr. three times daily.

Tannin has been considerably used, and is much vaunted by some authorities, both on experimental and clinical grounds. It may be given in doses of 15 gr. three times a day. The writer's experience has been rather unfavourable to its use, owing to the gastric disturbance which sometimes follows.

Menthol has been employed much, both in pulmonary and laryngeal tuberculosis, especially by intratracheal injection. A 20 per cent solution in olive oil is sufficient. Of this, one or more drachms may be injected once or twice daily. The remarks which have been made regarding intratracheal injections of creasote and guaiacol apply here equally. There is no question that symptomatically the patient is generally benefited.

Eucalyptus Oil or *Eucalyptol* is certainly of value. Under its use the patient often improves remarkably. Notably, expectoration is lessened. The oil may be given by the mouth, either in capsule, 5 to 20 min. thrice daily, or in emulsion along with cod-liver oil. Or it may be given subcutaneously, dissolved in liquid vaseline, or intratracheally, in olive or castor oil. Eucalyptol should not be used if there be kidney complication.

Iodoform.—Considerable difference of opinion exists as to the value of iodoform. There can be no doubt as to its significance in local (surgical) tuberculosis. On the whole, the evidence points to its value in pulmonary disease. Under its influence, cough and expectoration lessen. There is less tendency to hæmorrhage. In pyretic cases the temperature is sometimes favourably affected. It may be variously exhibited, e.g., in pill, $\frac{1}{2}$ to 3 gr. three times daily, or subcutaneously, dissolved in liquid vaseline (1 to 2 per cent). This has sometimes been combined with guaiacol and eucalyptol. Good results have been reported from its continued subcutaneous use. It has also been used intravenously. Iodoform is contra-indicated in presence of kidney disease. During its exhibition the urine should be examined frequently.

Cinnamic Acid or *Sodium Cinnamate* (*Hetol*) deserves mention. If the strong claims which have been advanced for the specific properties of cinnamic acid cannot be entirely admitted, its continued use is certainly beneficial. Sodium cinnamate may be dissolved in distilled water or normal saline solution, sterilized, and injected subcutaneously or intravenously. It has also been dissolved in oil or glycerin for the same purpose. It may be given internally in doses of 3 to 5 gr., or in the form of oil of cinnamon or oil of cassia (5 to 10 min.), e.g., added to an emulsion of cod-liver oil. Balsam of Peru, which has been used in various ways with benefit, probably owes its influence to the cinnamic acid it contains.

Camphor is similarly of service symptomatically in the form of camphoric acid, 10 to 20 gr. It has a special influence over night sweating. Camphor has been introduced subcutaneously and intralaryngeally, and even directly into the lung, with benefit. For such purpose it is dissolved in oil.

Formalin.—For cases of lung tuberculosis in which the larynx is involved, inhalation of formalin ($\frac{1}{2}$ to 2 per cent) is to be recommended. It is best exhibited on a light

oro-nasal mask made of fine, open-meshed muslin, which does not interfere with respiration, the patient keeping the muslin constantly moist.

Cyano-cuprol rests on the experimental basis that tuberculized guinea-pigs treated by this agent recover, or at least live considerably longer than control animals, and that evidence of healing properties is traceable on post-mortem examination. Good effects have been recorded in the earlier and middle stages of disease. Various other copper preparations have been recommended.

There is no end to the list of remedies which have been announced at one time or another as specifics. It would serve no useful purpose to present a long list of these. The following are perhaps worthy of mention at least, viz.: sulphur (including the natural sulphurous waters), mercury, iodine (including iodide of potassium), tar, carbolic acid, and other tar products (izal, cyllin, etc.).

Artificial Pneumothorax.—The production of pneumothorax, or collapse-therapy, as it is sometimes termed, has become a favourite line with many. It was recommended on physiological grounds a century ago (1821) by James Carson (Liverpool), who pointed out the need for, and the advantages of, absolute rest to the affected lung.

Principle.—The lung collapses before the entering gas (oxygen, nitrogen, purified air) to a more or less firm, airless structure. Discharges and secretions, if present, are forced from the passages and cavities. Tubes and cavities are flattened out more or less completely. Circulation within the lung—especially lymphatic—is immobilized. The advance of fibrotic change is hastened. Toxæmic symptoms—pyrexia, circulating disturbances, malaise, night-sweats—if in evidence, tend to lessen. The toxic reservoirs are emptied and the local factories closed down.

The method is simple and relatively safe. It is especially applicable in unilateral pulmonary tuberculosis without complications, running a comparatively slow course. It may be serviceable even in acute progressive affections, when limited to one side. Bilateral tuberculosis—when of chronic, non-aggressive type—may be assisted. It can be of little value if the second lung is in a state of advanced disease. On the other hand, a slighter degree of disturbance of the second lung is frequently benefited by the induction of pneumothorax on one side.

Other forms of surgical interference have been utilized as means of effecting a direct attack on the disease. More superficially-lying vomicæ have been opened and drained. Ribs have been extensively resected to admit of complete collapse of lung. The phrenic nerve has been divided to immobilize the diaphragm. The results, however, hardly justify recommendation of the procedures, as at present realizable.

III.—TO MEET SYMPTOMS AND COMPLICATIONS.

The symptomatic treatment of pulmonary tuberculosis is often made the chief, and sometimes the only, treatment. This is a great mistake. In proportion as the larger indications have been followed, there is little scope for symptomatic measures. Still, from time to time, symptoms must be met.

Cough.—The cause of the cough should be determined. This varies in different cases. We must see that it is not produced artificially, as by the condition of bedroom or residence. It is remarkable how an obstinate cough yields under conditions of hyperaeration day and night. Cough is sometimes maintained by certain agents used for inhalation, e.g., terebene, eucalyptus, or by the use of unphysiological respirators. It is frequently the expression of such a simple cause as smoking, especially cigarette smoking. Sometimes the patient keeps it up voluntarily. He thinks he should cough. He certainly coughs more than is needful for purposes of expectoration. In such cases it is well to explain to the patient that every cough tends to injury, by putting undue strain on the delicate lung tissue, and by forcibly spreading disease. Much can be done by training the patient to hold his breath, and by means of simple demulcent and sedative pastilles.

The routine use of expectorants in presence of cough is to be deprecated. They are seldom necessary, and tend to spoil the appetite, disturb the stomach, and generally derange the patient. Where the cough is irritating and resultless, sedatives, e.g., dilute hydrocyanic acid in glycerin, are useful, as in the following:—

℞	Acidi Nitrici Diluti	ʒj–iij	Glycerini	℥j
	Acidi Hydrocyanici Diluti	♏xlviij	Infusi Quassiæ	q.s. ad ℥vj

One tablespoonful to be taken thrice daily, immediately before meals.

Or small doses of morphine ($\frac{1}{12}$ to $\frac{1}{8}$ gr.); or better, as causing less disturbance of gastro-intestinal functions, codeine $\frac{1}{4}$ to 1 gr., dionin $\frac{1}{4}$ to $\frac{1}{2}$ gr., or diamorphine hydrochloride $\frac{1}{16}$ to $\frac{1}{8}$ gr. One or other of these may be conveniently given at bedtime and the first thing in the morning, in effervescent citrate of potash or soda-water. Of milder sedatives, hyoscyamus and belladonna may be mentioned.

When cough is due to irritation about the pharynx, it may be relieved by a menthol and cocaine pastille or by a spray of menthol in parolein (10 to 20 per cent). A similar spray is of value in irritation about the larynx or trachea. Or counter-irritation may be used, e.g., a blister over the manubrium sterni.

Expectoration. — Morning expectoration, which supervenes after the rest of night, may be rendered easier by the use of warm drinks, especially warm alkaline drinks. Boiling milk, to which an equal amount of one of the natural alkaline waters has been added, is often serviceable; or a tumblerful of warm milk with 2 to 4 teaspoonfuls of rum.

When expectoration is attended with difficulty, it may be eased by small quantities of ipecacuanha ($\frac{1}{4}$ to 1 gr.). With this may be advantageously combined 5 to 10 gr. of chloride of ammonium. When expectoration tends to be excessive, benefit is derived from terpene hydrate (2 to 5 gr.), or from 5 to 10 min. of terebene or eucalyptol. These may be combined suitably, in conditions of irritation, with codeine, diamorphine hydrochloride, or other sedatives.

Hæmoptysis.— (*See* Special Article.) For slighter degrees of hæmorrhage there is no need for special treatment. The infrequency of hæmoptysis is one of the more remarkable results of the open-air treatment of tuberculosis.

Dyspnœa.—This affords urgent call for complete hyperaeration. Some patients, dyspnœic when indoors even with windows freely open, are marvellously relieved when carried outside. In emergencies of the sort, aromatic spirit of ammonia is helpful. It may be given conveniently in 1-drachm doses in lemon-water. Where dyspnœa is associated with lodgement of discharge in the tubes which is not easily expelled, relief may be had by the use of stimulant expectorants, e.g., carbonate of ammonium, senega. The sudden dyspnœa following on pneumothorax is relieved by morphine.

Pain.—The cause of the pain varies, and should be determined where possible. If comparatively slight, and due to recent pleurisy, relief may be had by fixing the affected side by means of broad strips of sticking-plaster. If the pain is greater, counter-irritation by fly blister is most helpful. This is commonly more effective, and in the end less troublesome, than mustard or iodine. When the distress, as often happens, results from strain of the muscles in coughing, sedatives should be used for the cough, and a rubefacient liniment of oil, e.g., aconite, belladonna, and chloroform liniment, applied locally on spongiopiline or lint under oilcloth. Or a more sedative application may be made by means of poppy-head stupe. When pain is due to more widespread congestion, whether of tubes or lungs, a large poultice, to which mustard may be added, is often serviceable.

Pyrexia.—The effect of hyperaeration on pyrexia is striking. It is extraordinary how quickly temperatures which have swung more or less violently for months under the older treatment in more or less confined rooms, become normal in the course of days or weeks or months. It may take months of persistent hyperaeration to attain the effect. Yet patience through long periods is amply rewarded. In such cases, the air-supply cannot be too great and direct.

Apart from drug treatment, the cause of pyretic disturbance should be carefully sought, with a view to its exclusion. The tuberculous patient is more highly sensitive to disturbing influences than the normal subject. Thus, fatigue, excitement, gastro-intestinal irritation, and the like, readily affect his temperature. Consequently, the temperature should be carefully taken at least twice daily, and, in more anxious cases, every three hours. Where pyrexia is present, the temperature curve should be carefully analyzed to determine if there be any uniformity in the recurrence of pyrexia, and if there be any relationship with times of exercise, meals, etc.

If pyrexia seem to follow fatigue, the indication is rest. If it be associated with gastro-intestinal disturbance, the dietary should be revised, and in most cases simplified. Thus the patient may be placed on a milk dietary, or, again, on a raw-meat dietary (raw-meat juice, raw eggs). Or the bowels may require attention. A dose of castor oil may have remarkable effect. Daily repeated 1-drachm doses of castor oil, with a minute quantity of

opium, are sometimes serviceable. When there is no evident and removable cause, hydrotherapeutic measures may prove helpful—for example, sponging with cool or cold water, to which may be added eau de Cologne or toilet vinegar. Or the wet pack may be tried, or a cool or cold bath, with care.

For the same purpose, inunction with guaiacol, 1-drachm doses, over the skin of the thorax, may be serviceable. It must be practised with caution, as sometimes grave depression has followed the application. It may be used pure, or in combination with soft soap and olive oil, as in the accompanying prescription :—

℞ Guaiacolis ℥j | Olei Olivæ q.s. ad ℥iij
Saponis Mollis Peroleati ℥j

A tablespoonful to be applied by inunction.

Antipyretic drugs should be used with some caution. It is easy enough to lower temperature by such means : it is more difficult to say to what extent the patient has benefited. Quinine is largely used, but there exists doubt as to the degree of efficacy. In lesser pyrexia, small doses of, say, 2 gr., dissolved in dilute acid, are sometimes helpful. In more persistent pyrexia, quinine is of less service. The old-fashioned combination of quinine (1 gr.), digitalis (½ gr.), along with a small quantity of opium, may assist. Some stubborn cases yield to the regular exhibition of strychnine—e.g., liquor strychninæ hydrochloridi 3 to 10 min. every four hours. Or quinine, digitalis, and strychnine may be combined. In obstinate cases, where the cause of the pyrexia cannot always be determined, cryogenin (meta-benzamine-semicarbazide) has proved of signal service. It may be given in doses of 5 to 10 gr., twice or thrice daily, conveniently an hour or so before the expected rise of temperature. In the same way pyramidon, a coal-tar derivative, may be serviceable (5 to 8 gr.). Or phenazone in 5- to 10-gr. doses twice or thrice daily may be tried, especially when there is attendant discomfort, headache, and other irritability. Phenacetin in similar doses may prove helpful. It is not advisable to prolong the use of such antipyretics for many days. They should be stopped in any case when gastro-intestinal disability ensues.

The administration of alcohol offers distinct advantages in the pyrexia of advanced disease. If exhibited an hour or so before the temperature tends to rise, it frequently prevents this, while at the same time it lessens tissue waste in patients unable to take sufficient nourishment. As to form, pure spirit (whisky, brandy) is usually wisest, diluted with milk, or mixed with eggs and milk as egg flip, or in alkaline water.

Gastro-intestinal Disturbance.—As already indicated, digestive troubles are remarkably lessened under the open-air régime. This is so striking, that it is almost useless to speak of treating them under other conditions. If they fail to yield to this, the diet sheet and prescriptions should be revised. We must make sure that the disturbance is not maintained from without. Simpler diet and the exclusion of drugs may make a vast difference. Thus, limitation to raw meat or to a milk diet for a few days may prove sufficient. The condition of the teeth should be considered.

Loss of appetite is sometimes removed by the use of ordinary bitters taken half an hour before food, while the patient is resting, or by a little dilute acid. Some patients do better with a corresponding dose of alkali before food. The application of an ice-bag over the stomach half an hour before meals has sometimes a remarkable effect on the appetite.

A feeling of fullness and discomfort about the stomach, with a tendency to sickness, is often best relieved by a mild alkaline drink, e.g., bicarbonate of sodium, 5 gr. in hot water, shortly before meals ; or by a glass of boiling water taken sip by sip, half an hour before meals or, it may be, two or three hours after food. The occasional use—perhaps every second or third day—of minute doses of grey powder (½ to 1 gr.) is sometimes effectual. A drop or two of creasote or of weak tincture of iodine, or a few drops of aromatic spirit of iodine, diluted and taken after food, is similarly helpful. Or 10 to 15 gr. of bismuth may be given with meals.

Where vomiting occurs as the result of cough (*toux émétisante*) it may be prevented by small doses of a sedative, e.g., morphine, codeine, diamorphine hydrochloride, just before meals. Creasote taken with meals seems likewise helpful. A mustard poultice over the epigastric region has similar value. It is sometimes serviceable to anticipate

this variety of vomiting by making the patient sick the first thing in the morning, by tickling the throat or by other simple means. This generally saves his being sick after meals.

Diarrhœa.—This may be due to a variety of causes. Some judgement is required in determining the point. Thus, it may depend on dietetic error or drug, on simple or tuberculous enteritis, or on waxy disease of intestine.

A dose of castor oil (and it is the safest purgative) may be needed to remove existing irritation. Thereafter a simple milk dietary for some days, or the adoption of more or less strict zomotherapy, may prove of the utmost service. In most cases, one or other form of bismuth is helpful. In simpler cases, 10 to 20 gr. of subnitrate of bismuth with each meal may be sufficient, while in more pronounced cases, with offensive stools, salicylate of bismuth (5 to 15 gr.) is more serviceable. Where pain accompanies the diarrhœa, or where the latter is excessive, the addition of a small quantity of morphine is indicated. Of other drugs, liquor calcis saccharatus (1 drachm) or other chalk preparation may be tried. Of vegetable astringents, logwood (e.g., ½ oz. of decoctum) is perhaps the best.

Where the condition is more certainly due to tuberculous involvement of the bowel, the diarrhœa calls for the strictest attention dietetically on the lines already indicated, and salicylate of bismuth with morphine will generally prove of much assistance. It is often necessary, however, to alternate among a variety of antiseptic and astringent drugs, of which may be cited, in addition to those already mentioned, salol, tannin, tannoform, sulphate of copper, acetate of lead, and oxide of zinc. The continued use of creasote sometimes proves more helpful than anything else. In milder cases, petroleum emulsion does good service.

Night Sweating.—This classic symptom, as it used to be considered, hardly ever occurs where hyperaeration is sufficiently achieved. The rapidity with which persons who have been persistent night sweaters, and have suffered in consequence from broken sleep and corresponding depression, have lost the symptom under physiological treatment, is one of the most striking facts in clinical medicine. If, for any reason, open-air methods cannot be efficiently carried out, or the tendency persists notwithstanding such measures, the clothing, nightdresses, and bedclothes should be looked to. They must be as light as is compatible with comfort. At bedtime, the patients should be freely sponged with acidulated, or sometimes with alkaline, wash, and this may be followed by dry-rubbing. Thereafter the surfaces may be freely dusted with tannoform powder. Irritating external applications should be avoided at bedtime. Internal drugs will be seldom necessary. Of these may be mentioned atropine ($\frac{1}{100}$ gr.), extract of belladonna (⅛ gr.), camphoric acid 10 to 20 gr.), picrotoxin ($\frac{1}{100}$ to $\frac{1}{50}$ gr.), and agaricin (⅛ to ¼ gr.). The writer's experience is that, with proper attention to the physiological requirements, the need for special drug treatment for night sweating is quite exceptional.

Insomnia.—Bad sleepers, even without tuberculosis, usually sleep better in the open air. This is emphatically true of the tuberculous subject. If the open air prove insufficient, sleeplessness is often averted by some such simple means as a warm drink at bedtime, e.g., of dilute milk, malted milk, thin soup, or dilute toddy. The lessening of the evening meal proves beneficial to some persons. Constipation, flatulence, and other gastro-intestinal disturbances should be looked to. Painful conditions must of course be excluded. Irritating applications should be avoided at bedtime. If iodine is used it had better be applied in the morning rather than at night, and at bedtime the surface be dusted over with a soothing powder. If irritating cough be present, a slight sedative may be added to the warm drink, e.g., codeine, dionin, or morphine. Of hypnotics proper, perhaps the most valuable are paraldehyde (1 to 1½ drachms), sulphonal (15 to 20 gr.) dissolved in hot fluid, and methylsulphonal (10 to 15 gr.).

Anæmia.—Arsenic is of greatest service in the treatment of the anæmia of tuberculosis. It is to be preferred to iron, which in most cases is of doubtful value. Arsenic, freely diluted, should be used for prolonged periods. Raw-meat feeding is often most serviceable.

The treatment of other complications—laryngeal, peritoneal, and genito-urinary—is considered under several appropriate headings. *R. W. Philip.*

PURPURA.—The condition termed 'purpura' is not a disease, but a symptom. The conditions with which it is associated, and of which it is a manifestation, are often of an infective and septic nature. The chief indication in all such cases is the removal by appropriate measures of the infective conditions which underlie them, if these can be found.

Apart from that, the chief indication is complete rest in bed, with the use of tonics, good food, fresh air, with arsenic in full doses in simple purpura, and salicylate of soda in so-called rheumatic purpura; in all cases correction of the possible sepsis of the alimentary tract by intestinal antiseptics, best of all some form of mercury (hydrarg. c. creta, liq. hydrarg. perchlor.), or oil of turpentine, 10 to 15 min. three or four times per day.

For hæmorrhage, the best remedies are lactate of calcium in 20-gr. doses four times daily for three or four days, to correct the diminished coagulability, and liq. arsenicalis and tinct. ferri chloridi as tonics. Polyvalent antistreptococcic serum has been used successfully in some severe cases. It may be given by the rectum, 10 to 20 c.c. being injected the first day, and half that quantity the next three or four days. Normal horse serum may be given subcutaneously in doses of 10 c.c., or whole human blood may be injected intramuscularly in doses up to 20 c.c. Adrenalin may be used locally as a styptic.

William Hunter.

PYÆMIA.—(*See* SEPTICÆMIA.)

PYELITIS AND PYONEPHROSIS.—Pyelitis, or inflammation of the pelvis of the kidney, may be acute, subacute, or chronic. It is generally due to the *Bacillus coli communis*, which can be recovered from the urine in pure culture. One or both kidneys may be affected. It occurs at all ages and in both sexes, and is a well-recognized illness in infancy and childhood.

In many cases the infection is hæmatogenous, the focus lying in the alimentary tract. Thus gastro-enteritis, constipation and intestinal stasis, hæmorrhoids and ulceration, or fissures near the anus may be the primary focus. In five out of eight cases of acute pyelitis in infants, John Thomson found excoriation or fissure of the anus.

But, apart from these general predisposing causes, local conditions in the urinary tract may play an important part in the causation of the disease, in particular anything which causes obstruction to the free flow of urine. Among the more important of these conditions are stricture of the urethra, enlargement of the prostate, and obstruction of the ureter, whether by calculus, stricture, or kinking as in the case of a movable kidney. In the later months of pregnancy, pyelitis occurs with sufficient frequency to be recognized as one of the complications of gestation, and this variety is commonly referred to as the pyelitis of pregnancy. Here, again, there can be no doubt urinary stasis plays an important part. A number of pregnant women were examined post mortem, and in two-thirds the ureters were dilated and filled with urine. The obstruction of the ureters is probably due to the enlargement and dislocation of the pelvic organs, which lead to kinking, stretching, or torsion of the ureters. With the termination of pregnancy, and diminution in the size of the uterus, many patients get well.

TREATMENT.—This is palliative and operative.

Palliative Treatment.—In the acute stage of primary or hæmatogenous pyelitis, palliative treatment is all that is necessary. The patient must be kept absolutely at rest in bed, upon a fluid diet of milk, eggs, chicken, veal and fish broths, jellies, and so on. The bowels should be fully moved daily, and a free diuresis induced by the freshly-made infusion of buchu or uva ursi, and three pints of distilled water such as salutaris should be taken daily. Urinary antiseptics form an important part of the treatment, and the various preparations which set free formaldehyde are particularly valuable, such as hexamine, cystamin, helmitol, and cystopurin. Salol is often useful. In some cases the patients do better if the urine is rendered neutral by such drugs as potassium bicarbonate and citrate. Large hot poultices to the affected loin should be frequently applied, and dry cupping is sometimes of considerable value.

If the condition is mild and more chronic in character, the patient may be allowed up, but avoidance of undue exertion and fatigue should be insisted upon, and, when possible, winter residence in a dry, warm climate is advisable. In the chronic stage, the administration of an autogenous vaccine may prove of great benefit.

As a rule these cases tend to improve slowly, and eventually a complete cure may be anticipated.

Operative Treatment.—In some instances, however, the condition does not clear up beyond a certain point. The urine remains somewhat cloudy, and on standing deposits a small sediment of pus, broken epithelium, and occasionally a few blood-cells. In such cases a cure may sometimes be hastened by catheterizing the ureter and instilling a small quantity of a 1 to 2 per cent solution of nitrate of silver into the pelvis of the kidney.

But when the free exit of the pus-laden urine from the pelvis is impeded, the condition becomes very much more serious, and to it is applied the name of pyonephrosis. The most common cause of this condition is blockage of the ureter by a calculus, with infection of the resulting hydronephrosis. Removal of the stone or other obstruction should be undertaken without delay, and the pelvis of the kidney should be freely drained through the usual oblique incision in the loin. If operation is deferred too long the kidney substance may be so completely destroyed that total removal of the organ may become necessary.

John George Pardoe.
(Revised by Hugh Lett.)

PYELONEPHRITIS.—By this is implied a suppurative inflammation of the whole kidney, both the pelvis and the secreting substance of the kidney being implicated. To this condition the term 'surgical kidney' is sometimes applied, and inasmuch as the condition undoubtedly follows infection of the bladder by unpurified instruments, the term is not in some cases a misnomer. Pyelonephritis is called primary or hæmatogenous when there is no pre-existing disease in the urinary tract. Secondary or ascending pyelonephritis is seen far more frequently, and is most common where long-standing obstruction has caused dilatation of the ureters and pelves of the kidneys, and is particularly liable to occur in chronic retention and difficult micturition due to enlargement of the prostate and old-standing stricture of the urethra. It is also very easily induced in cases of atony of the bladder dependent upon diseases and injuries of the central nervous system, such as locomotor ataxia, spastic paraplegia, disseminated sclerosis, and in complete transverse myelitis due to injury of the spinal cord. Indeed, in the latter class of case, however careful the medical attendant may be, and however strictly the catheter may be sterilized, cystitis and rapid extension of septic infection to the ureters and kidneys not infrequently terminates the patient's life. It is therefore essental to take the very strictest precautions in employing the necessary catheterism in these cases. But in laying stress upon the supreme need for asepsis in the catheterism of patients suffering from nervous diseases, the writer must insist that there is no excuse for the passage of unsterilized instruments into the bladder of any patient whatsoever.

Pyelonephritis may be acute or very insidious in its onset.

In the acute type the disease is marked by acute rise of temperature with rigors, a scanty secretion of urine, sometimes terminating in suppression, lumbar aching, a dry tongue and skin, and indeed all the phenomena of an acute septic infection combined with the particular renal symptoms. If unilateral, an immediate nephrectomy is the one chance of life for the patient, but only too often the infection is bilateral, and these cases are of necessity quite hopeless.

The chronic cases are most usually seen in those patients who have for some time lived a catheter life without paying due regard to the necessary aseptic precautions. The phenomena witnessed are those of chronic sepsis and renal failure, and unfortunately surgery is powerless to aid these cases when the disease is well advanced. Progressive emaciation, combined with an irregular pyrexia, constant dull lumbar aching, a dry skin, marked thirst, and a cachectic appearance, combined with the local signs of urinary trouble, form a picture which is not difficult to recognize.

John George Pardoe.
(Revised by Hugh Lett.)

PYLORIC STENOSIS OR SPASM.—(*See* Congenital Pyloric Hypertrophy.)

PYONEPHROSIS.—(*See* Pyelitis.)

PYORRHŒA ALVEOLARIS.

The disease begins as a marginal gingivitis, localized or more or less general. Later, the edges of the alveolar bone of the jaws become carious. There follows progressive bone destruction, resulting in the formation of pockets between the gum and the tooth. In very chronic cases, bone

destruction is accompanied by recession of the gum, and pockets are only formed late in the disease. The toothward sides of the gum are in a state of chronic ulceration which, together with the bone-caries, gives rise to a more or less obvious discharge of pus. The alveolar-dental membrane is thickened, and the bone round the tooth is absorbed to make room for deposits of granulation tissue. In very slow cases the bone reaction is sclerotic, but such cases eventually merge into the less chronic form. The débris accumulated in the pockets undergoes putrid decomposition. The edge of the gum may be inflamed and swollen, bleeding readily when touched ; or in more chronic cases it may shrink *pari passu* with bone destruction, and expose the neck of the tooth. Gradually the teeth become tender on pressure and loosened, and abscesses along the side of a denuded root, in the pocket between it and the gum, become frequent. There is generally more or less tartar.

As regards effects on the general health, the extent of the ulceration and the amount of discharge, as indicating the possibilities of absorption of germs and toxins, and the existence of putrid decomposition, are the important points. Resistance varies greatly in different individuals, but, in general, systemic infection is only a question of time : the disease ultimately leads to a more general infection, showing itself in some part of the body.

Pyorrhœa alveolaris originates in the stagnation of germs in the periodontal sulci round the necks of the teeth. The addition of sticky food-débris (fine ground flour) increases their power for evil by providing a suitable food. Overlapping edges and rough surfaces of stoppings, ill-fitting crowns, gold caps, and bridges, and unclean plates add to the natural possibilities of stagnation. The disease is of local origin, and is to be found in persons as young as ten years of age. A marginal gingivitis in childhood eventuates in a few years in a fully-developed pyorrhœa alveolaris.

Any deviation from the normal pale-pink, thin-edged condition of the gums is a dangerous sign, whether in the direction of hypertrophic or of destructive inflammation. Minute examination for pockets must be made with fine steel probes. *X* rays are of great service in showing the extent of bone destruction. Pus and decomposing food are to be sought for by expression, and by mopping out the pockets with cotton-wool twisted round the end of a fine steel probe. What is expressed must be actually smelled ; the smell will be made more evident on warming.

Prevention.—The disease is of local origin, and can be prevented by cleanliness. The one important part to clean is the neck of the tooth. Adequate cleaning must be begun in childhood.

Treatment.—1. Extraction, the only permanent cure.

2. Alternate extraction, which aims at isolating teeth in order to facilitate drainage and cleansing.

When teeth are retained :—

3. Destruction of pockets, by cutting away gum and drilling away bone till every part of the tooth not united by vital attachment to the bone is laid bare and made cleansable.

4. Removal of all tartar and artefact stagnation-areas, e.g., rough fillings, faulty crowns.

5. Permanent cleanliness.

In early cases, thorough scaling and proper daily cleansing will effect a practical cure. Teeth which have lost the major part of their attachment are better extracted. Multi-rooted teeth between whose roots bone-destruction has extended should be extracted since drainage is impossible.

In determining treatment, the general health must be the first consideration. This is far more seriously affected by sepsis than by absence of teeth. Vaccines are often of great use in relieving the general effects of the disease, such as the various forms of 'rheumatism', but in the writer's experience are of no service in curing the local condition. They cannot prevent re-accumulation of germs and débris, or decomposition, and the patient's efforts at cleaning far too often fall very short of the requisite standard. Hence extraction is to be recommended when there is any serious general infection, or when local treatment fails to relieve the remote condition.

Ionic medication is of doubtful value. If all that is claimed for it be true, it can still be only of temporary value : in the absence of destruction of pockets and daily cleaning, reinfection must occur. In the writer's opinion it is merely an elaborate method of mopping out the pockets.

After excision of gum the exposed roots are often very sensitive. Rubbing with powdered nitrate of silver will relieve the tenderness, but will stain the part black. Weak tincture of iodine applied to the necks of the teeth and edges of the gums, every other day, diminishes the activity of bacterial growth. The sum total of treatment is—*clean, render cleansable, and maintain cleanliness.* *Joseph Geo. Turner*

QUINSY.—(*See* ABSCESS.)

RABIES.—A curative treatment for rabies when the disease has become developed in man or animals has yet to be discovered, and as far as we know no recoveries have been known; for these reasons the treatment of a person suffering from rabies can only (for the present) be of a palliative nature, such as may be obtained by the use of sedative drugs and other remedies for the relief of painful symptoms. In this connection I may mention that atropine has been used in India at the suggestion of Major F. Norman White, I.M.S., and with very beneficial effects in relieving throat spasm; when given at suitable intervals this distressing symptom can be entirely obliterated; $\frac{1}{100}$ gr. of the sulphate injected subcutaneously every four hours is usually sufficient to obliterate spasm, and in addition there is always in the background the hope that in certain cases throat spasm (which is the proximate cause of death) may be held in check until a phase of recovery has set in. The attention of medical practitioners is drawn to atropine in cases which have developed symptoms of rabies.

Knowing that the curative treatment of rabies holds out very slender hopes of success, it is necessary to fall back upon two other recognized methods of attacking the disease; viz., to prevent the infective element from obtaining access to persons; and, failing this, to confer an active immunity against the disease during the early stage of the incubation period. The former practically means restrictions applicable to dogs, and the latter anti-rabic treatment, including local treatment of the bites or seats of infection.

RESTRICTIONS APPLICABLE TO DOGS.

This, being a veterinary subject, may be dismissed in a few sentences embracing the main points, viz.:—

1. The muzzling of all dogs in an infected area for a sufficiently long period, and to include a sufficiently wide extent of country.

2. Restrictions on the movements of all dogs into or from an infected area.

3. The destruction of all stray unmuzzled dogs in infected areas, and, of course, the destruction of all apparently rabid dogs.

4. Immediate notification to the proper authorities (police in most cases) of all cases of rabies.

5. A strict quarantine on the importation of all dogs from abroad.

These measures have proved successful in stamping out the recent outbreak of rabies in England, and taken as a basis would be likely to prove useful in any country.

LOCAL TREATMENT.

When persons are bitten by animals suspected of rabies, it is most important that the wounds should receive the earliest possible attention. The problem is the following: In some cases the biting animals are known to be rabid, and in others there are grounds for suspecting rabies; the danger depends on the amount of virus implanted in the wound; is it possible to remove all the virus from the wound, or, failing this, can we get rid of some of it? How can we best accomplish this object?

It is doubtful whether any local treatment can free a wound from rabies virus, but when appropriate local treatment is carried out early and efficiently it may be relied upon to destroy some of the virus *in situ*, and possibly in some cases the whole of it. The destruction of some of the virus in the wound is of great advantage, as it diminishes the chances of infection, prolongs the incubation period, and gives more time and better conditions for subsequent antirabic treatment. Experience has proved that undiluted carbolic acid is the most efficient and least painful application; it should be well rubbed into the wound, and then washed out immediately with water to prevent destruction of tissue. Pure carbolic acid penetrates into the recesses of a wound and is not prevented from doing so by fatty tissue. Crude phenyl also answers well, and so do izal, lysol, and somewhat similar preparations when used like carbolic acid; also iodine. In the absence of any of these substances, caustic potash, caustic soda, or nitrate of silver answers the purpose when well rubbed into the recesses of the wound, but they cause considerable pain. Mineral acids and the red-hot iron are cruel methods of treatment, especially when applied to wounds of the head, face, or neck; no advantage is gained by their use over the

other methods which cause less pain and disfigurement. When none of the applications mentioned are at hand, Condy's fluid or any antiseptic lotion may be used; and as a last resource it is better to wash the wounds with hot or cold water rather then do nothing, as this may wash out some of the virus.

When the tissues around the wound are excised, there is a danger of the virus in the original wound infecting the larger wound. Excision applied to wounds of the head, face, or neck has its drawbacks, especially where subsequent examination proves that the biting animal was free from rabies. When a person sucks a rabies-infected wound there is the possibility of the virus infecting his lips or gums.

To summarize: Although local treatment has its uses, it cannot be relied upon always to prevent infection; but, carried out early and efficiently, the virus in the wound may be diminished, chances of infection decreased, the incubation period prolonged, and the subsequent antirabic treatment which is still necessary made more certain of success. This is the most that can be claimed for local treatment.

Early local treatment means treatment within half an hour of the infliction of the bite; it is said to do some good up to 8 to 10 hours, but it probably is not of much benefit after 3 to 4 hours, and certainly none after 24.

ANTIRABIC TREATMENT.

As no form of local treatment can be safely relied upon to prevent hydrophobia, antirabic treatment is necessary in every case where there are reasonable grounds to suspect infection, the object being to confer an active immunity against rabies as soon as possible after infection. To be effective it is necessary that immunity sufficient to protect against the disease should be attained before the virus has had time to reach the nerve centres, or, in other words, the bitten person should be rendered immune during the early stage of the incubation period.

All methods of antirabic treatment are based on the use of vaccines prepared from the virus in the nerve centres of rabbits which have succumbed to rabies after inoculation with 'fixed virus'.

The necessity for using the nerve centres of rabbits is owing to the fact that as yet it has not been possible to obtain rabies virus in a pure form and in sufficient quantity except in the nerve centres of rabid animals, and rabbits supply virus of a fixed virulence suitable for the preparation of vaccines. The treatment, which is preventive, and not curative, was devised by Pasteur in 1885, and was based on his experiments with the fixed virus in rabbits' cords attenuated by drying. Since Pasteur's time the treatment has undergone certain modifications, but the underlying principle is the same. The original method is generally referred to as the 'dried cord method'.

It is most important that treatment should be carried out as soon after infection as possible. When the bites are on the head, face, or neck, early treatment is imperative; when on distant parts of the body, time is not so pressing; but it is never advisable to waste time in any case. The treatment consists in the daily hypodermic injection of vaccine into the cellular tissue on the sides of the abdomen, and extends over a period of from fourteen or fifteen to twenty-one days, according as to whether light, medium, or intensive treatment is necessary. In the intensive treatment, injections are given twice a day for the first few days. The kind of treatment depends on the amount of infection (whether light or heavy), seat of the bites, whether local treatment was carried out early and efficiently, and whether time was wasted before coming for treatment.

1. **Dried Cord Method.**—Pasteur's original method was to dry the spinal cords hung in glass jars over caustic potash or caustic soda (to absorb moisture) and—under fixed conditions as regards temperature, humidity of the atmosphere, and exclusion of light—the drying process was carried out for various periods up to fourteen days from the time the cords were removed from the rabbits. A cord submitted to these conditions loses all its virulence in fourteen days, but when dried for only three days the virulence is practically the same as that of a fresh cord. Attenuation commences after the third day and is complete in from twelve to fourteen; but, practically speaking, it is a weak, attenuated, and in some cases a dead virus after the eighth or ninth day. From cords thus treated vaccines of different strengths can be prepared. Pasteur commenced treatment by vaccines from cords which had been dried for fourteen days, and then daily down the scale to cord

which had been dried for three days only. By this means he was able to commence treatment with vaccines which were perfectly safe, and which established a degree of immunity sufficient to render the injection of living and virulent vaccines also quite safe. The dose for an adult consists in 1 cm. of cord finely ground down in 3 c.c. of a sterile fluid such as normal saline solution ; it corresponds to about 5 per cent cord emulsion.

This method, modified in some respects, is still carried out at the Pasteur Institute, Paris, and at many other antirabic institutes in different parts of the world. A modification which is sometimes used, especially when the vaccine is sent to a distance, is to dry the cords from two to six days, and preserve them in glycerin in a cool chamber until they are required.

2. **Dilution Method.**—Some time after Pasteur inaugurated his system of antirabic treatment, Högyes, of Buda-Pesth, introduced a method of treatment by injecting high dilutions of a living and virulent virus to begin with, and gradually going on to lower dilutions. In this, which is known as the '*dilution*' method of treatment, it is convenient to begin by making a 1 per cent dilution of the fixed virus from the fresh cords or medulla, and from this to prepare any dilution required. The treatment is commenced by the injection of a highly diluted virus such as 1–10,000, or 1–6000, and in some institutes 4000, or even 1–2000, and gradually going on from day to day to a less diluted virus, such as 1–500, 1–200, or even 1–100. The dilution method has been adopted in some antirabic institutes ; it has the merit of being easier to carry out, and is less expensive than the 'dried cord' method, but whether it is the safest and best is disputed.

3. **A Combination of Rabies Vaccine and Antirabic Serum.**—Within recent years antirabic serum has been occasionally used either as a preliminary to vaccine treatment or to sensitize the living vaccine ; but I am not aware that as yet any final decision has been arrived at either favourable or otherwise.

The serum is prepared by immunizing sheep or horses to a very high standard by systematically inoculating them with rabies virus for about six months. The serum is highly rabicidal when mixed with living rabies virus. In 1902, when Director of the Pasteur Institute of India, Kasauli, I immunized two horses to a very high degree and used the serum as a preliminary to the 'dried cord' treatment in 202 cases of multiple bites through the exposed skin ; many of them bitten by jackals, and most of them late cases. Of the 202 cases, 3 were failures. My object was to confer a passive immunity by means of the serum pending the acquirement of an active and more lasting immunity by vaccine treatment. In the circumstances it is difficult to say whether any real benefit was derived from the serum. In a number of the most severely bitten of these cases—and most of them bitten by jackals, but early cases—the serum was injected into and around the wounds with the object of utilizing its rabicidal properties on the virus locally ; none of these cases developed hydrophobia. But, here again, the treatment which followed the serum might have been all that was required to save them. The subject requires further investigation and on a larger scale.

4. **The Carbolized Vaccine Method (Dead Rabies Virus).**—In 1910, when Director of the Central Research Institute of India, I investigated the question of the preparation of a safe and efficient antirabic vaccine, and carried out a series of experiments on the action of carbolic acid and other agents on rabies virus, and the immunizing properties of a rabies vaccine killed and preserved in carbolic acid. My experiments with the dead virus were carried out on dogs, monkeys, and rabbits, and proved conclusively that these animals can be highly immunized by hypodermic injections of a rabies virus killed and preserved in carbolic acid.

The proof of the efficiency of this vaccine in the antirabic treatment of human beings has been established in India, where it has been in use at the Pasteur Institute of India, Kasauli, since 1912, and at three other Pasteur Institutes, viz., Coonoor (in Southern India), Assam, and Rangoon.

At the Institute in Kasauli, between the years 1912 and 1916, 22,579 persons were treated with dead carbolized vaccine, with 0·6 per cent of failures. Of the cases treated 1009 were Europeans, and these gave only 0·19 per cent of failures. These results are extremely good, and compare most favourably with any other method of antirabic treatment. During the recent outbreak of rabies in England 40 persons were treated with this vaccine with no failures.

The vaccine is prepared from the fresh brain, medulla, and spinal cords of rabbits which have died from rabies after inoculation with 'fixed virus'. The material is finely ground down in 8 per cent dilutions in sterile normal saline solution to which has been added pure carbolic acid to the extent of 1 per cent ; it is then filtered through fine muslin into a sterile glass receptacle to remove any particles of fibrous tissue which may be present, and kept at a temperature of 37° C. for twenty-four hours. At the end of this time the virus is dead, and it is now diluted with an equal volume of sterile normal saline solution, mixed, and filled into sterile glass bottles (20 to 30 c.c. bottles) capped with rubber caps and sealed with melted paraffin wax. On the preparation of a 'brew' two tests are carried out, one for sterility and the other by inoculating a rabbit or guinea-pig to prove that the virus is dead. This preparation gives a 4 per cent dilution of dead virus in 0·5 per cent carbolic acid normal saline solution, a dilution suitable for treatment purposes, and containing sufficient carbolic acid to preserve the vaccine and prevent any subsequent accidental contamination. The vaccine can be prepared at any well-equipped laboratory, and by any bacteriologist skilled in the preparation of the bacterial vaccines in common use, and sent wherever it is required ; and any medical man with a knowledge of the administration of bacterial vaccines could carry out the treatment of persons bitten by rabid animals.

It will be seen that this system does away with the necessity of having a special Pasteur Institute for antirabic treatment ; and in the event of an outbreak of rabies in any country the vaccine could easily be made available and, practically speaking, brought to the doorstep of persons bitten by rabid animals. Its efficacy has been proved by its use in India since 1912 ; and knowing that it is a dead vaccine, there need be no hesitation in recommending treatment as a safeguard when there is the slightest ground to suspect infection. In England the vaccine is prepared at the laboratories of the Ministry of Health, and during the recent outbreak of rabies the Ministry arranged for antirabic treatment to be carried out at six local centres, viz., Plymouth, London (St. Thomas' Hospital), Cardiff, Birmingham, Manchester, and Newcastle-on-Tyne. The vaccine was sent to these centres as required, with full instructions as to its administration, dosage etc., and examples of light, medium, and intensive treatment. When kept in a cool place and screened from the light the vaccine retains its immunizing properties unimpaired for three or four months at least, and probably for a much longer period.

Advice to Persons undergoing Antirabic Treatment.

Persons undergoing antirabic treatment by any of the methods described are advised to live under as healthy conditions as possible, and a liberal diet is recommended ; they should avoid fatigue, chills, long walks, and violent exercise. The use of alcohol in any shape or form should be especially restricted. This advice should be adhered to for ten days after the completion of treatment. When these conditions are adhered to it is the exception for inconvenience of any kind to supervene, and those undergoing treatment can go about as usual, merely attending once or twice a day for inoculation as the case may be. On the other hand, neglect of this advice, especially in regard to violent exercise and alcohol, might bring about nervous symptoms necessitating the suspension of treatment for a day or two.

The object of the advice given is not only to avoid complications, but to place the patient under the most favourable conditions possible to respond to treatment by the elaboration of immune bodies against rabies. *D. Semple*

RADIOTHERAPEUTICS.

The fundamental principle involved in the use of the *x* rays in therapeutics is that, after certain minimum exposure to their influence, changes take place in the living tissues. If the exposure has been short, the changes may not be observable to ordinary inspection; yet it is within the knowledge of all who have had an extensive experience of this subject, that cases of long standing will get well under the influence of a series of such exposures without any visible reaction at any time. This is an ideal state of affairs, but unfortunately not practicable in a large number of cases. As a rule our aim is to get as near a definite reaction as possible, and this may be done in a single application or may be distributed over several ; much depends on the nature of the condition with which we are dealing.

If the dose of the rays has been sufficient to bring about a definite reaction, the change observed is, roughly, a cellular degeneration affecting the epithelium of the surface and the gland

and, to a less degree, the endothelial lining of the blood-vessels. As the degeneration proceeds, inflammatory reaction comes on, the vessels are dilated, and there is marked migration of leucocytes and red corpuscles. The active leucocytosis is one of the essential features of the reaction, and probably the most important agent in bringing about any resulting cure. The changes in the blood-vessels do not occur to any appreciable extent when the milder doses are given; but when the irradiation has been severe, the intima is thickened and swollen, there is proliferation of the endothelium, and the lumen is narrowed and may be completely blocked. In these changes we have some explanation of the extreme chronicity of the severe *x*-ray burn; it is a case of starvation of the part through loss of blood-supply. The same thickening of the intima is seen after a series of mild doses carried on for a considerable time, and the use of this property in treatment will be referred to later.

The degeneration of epithelium may be looked upon as the result of injury through over-stimulation. The amount of such over-stimulation that any particular type of cell will stand without getting beyond the power of recovery bears a direct proportion to its vitality. If we expose an area made up of normal and abnormal cells to this form of irradiation, and so regulate the dose that the normal cells are still able to recover more or less completely, it will be found that, after healing has taken place, the abnormal cells have disappeared. On account of their lower vitality they have succumbed to a degree of over-stimulation insufficient to destroy normal cells. It is sometimes said that the abnormal cell is more easily destroyed because the *x*-rays have what is called a 'selective action'. This is attributing to the rays a faculty more or less human in character, and savours of over-enthusiasm. If true, how is it that normal tissues can be inflamed, and even destroyed, with the administration of doses of the *x* rays not greatly in excess of those regularly used in treatment? The lower resisting power of the abnormal cell is the more likely explanation; it certainly puts less strain on the imagination.

In the foregoing remarks we have, quite briefly, the histological basis of the philosophy of *x*-ray treatment so far as it is understood at present. But from observations made there appears to be more in it than this. When a patient with psoriasis has one or two patches irradiated, it has been noticed that other patches, not so treated, get better almost as quickly. The same has been observed in the treatment of chronic acne vulgaris, and other conditions of a kindred nature. With our present knowledge we must be careful not to dogmatize on the matter, but it looks very much as if the irradiation was instrumental in causing the formation of antibodies, or vaccines, and that these have an importance in the curing process equal to any other factor. If such should prove to be the case, the value of the *x* rays as a therapeutic agent will be very much enhanced, and be a great gain to medical science. It will be seen how the establishment of such a theory will do much to rob *x*-ray treatment of many of its risks, though under modern conditions of working these have been almost eliminated, especially in the hands of the experienced radiologist.

Apparatus.—With an *x*-ray outfit for diagnosis, few accessories are needed for carrying out proper *x*-ray treatment. If an outfit has to be obtained for therapeutic purposes only, it may be less powerful and less elaborate in nearly every way. A coil giving an eight-inch spark of good volume is sufficient, and the interrupter may with advantage be of a very simple type. It is inadvisable to use one that gives a very high rate of interruption, and therefore the old-fashioned 'dipper' pattern is as useful as any. Many of the high-speed breaks can be set to run comparatively slowly, and so answer our purpose. The disadvantages of high-speed breaks are that they very readily bring about an overheating of the *x*-ray tube and alter its vacuum, which, in turn, alters the character of the rays given out by it.

The tube-stand should be so made that the tube may be adjusted and secured in any convenient position. The tube must be enclosed in an *x*-ray-proof shield, fitted with an opening opposite the point from which the rays are given off, and through which the rays must pass to the part under treatment. To this opening nozzles of lead glass can be attached, and as these are of different sizes and shapes, we can confine the action of the rays to any desired area. The rest of the patient's body, and the operator, are fully protected from any injurious influence of the *x* rays. Protective devices of the most elaborate kind have been designed at various times, principally on behalf of those who have been so unfortunate as to contract chronic *x*-ray dermatitis. For such as these no protective device or precaution can be too elaborate; but it may be pointed out that, for those who are taking up this work for the first time, or who have not suffered from over-exposure in any way, a tube-stand, as above referred to, is quite sufficient so long as a few common-sense rules are observed. No radiologist should ever get within the active field of an *x*-ray tube unless absolutely necessary, and then only for the shortest possible time, which seldom need exceed a few seconds. He should always stand behind the plane of the anticathode, and if possible at a distance of two metres from the tube. When it is necessary to go into the active field, protective gloves should be worn, and if the fluorescent screen is used, it must be faced with a sheet of lead glass. It is quite possible for the operator to do a morning's work without coming within the active field of the tube

even for a moment, while keeping every part of the apparatus, as well as the patients, under full observation. With our present knowledge and available appliances there should be no occurrence of further cases of chronic *x*-ray dermatitis; if any arise they will be due entirely to the carelessness and negligence of the victim himself. The unfortunate experiences of the past make it necessary to be very explicit on this point.

Dosage.—The measurement of the dose of the *x* rays is a subject that has engaged the attention of some of the greatest authorities in physical science, but the result is far from satisfactory. As yet, the means at our disposal depend on the action of the rays on certain inorganic substances, and while these answer our purpose up to a certain point, the fact remains that the effects on organic living tissues and on inorganic dead material do not run on strictly parallel lines. On the other hand, by making ourselves thoroughly familiar with one or other of the methods that have been elaborated for *x*-ray measurement, we find that the standard dose can be fractionally divided, or, when large doses are required, can be multiplied, with results that are fairly satisfactory in practice.

It would be outside the scope of this article to attempt to describe even a small proportion of the various methods that have been recommended; such may be found in some of the large works devoted entirely to these branches of science. The method advised is that described by Sabouraud and Noire, which depends on the property possessed by platino-cyanide of barium of changing colour under the influence of the *x* rays. This is the method very largely employed in the treatment of ringworm, and, used according to the directions, the standard dose represents just so much as the skin will bear without an active dermatitis following, but sufficient to cause the hairs to fall out.

Latterly we have been able to obtain *x*-ray tubes specially designed for therapeutic work, and the advantage of these is that the vacuum can be adjusted to almost any degree and by means of an automatic regulator can be kept practically constant for any length of time needed in practice. The standard Sabouraud dose requires that the 'hardness' of the tube should correspond to No. 7 Benoist scale. The tube holder is so arranged that the area under treatment is kept at a distance of 15 cm. from the anticathode, and the small pastille is suitably placed exactly midway between. This must be protected from ordinary light during the application. When the full dose has been given, its colour will have changed from a greenish-yellow to an orange tint. With each set of pastilles is provided a standard tint with which the one in use is compared from time to time until the two exactly match. Using a current through the tube of about one milliampère, this will take from seven to fifteen minutes, but a great deal depends on the apparatus and the person in charge of it. The comparison of the pastille must be made with the minimum exposure to ordinary light, which changes the colour back to the original one, and this especially applies to daylight. If the comparison is made by electric light (metal filament lamps), the tint is arrived at sooner than when the comparison is made in good daylight. Latterly the instructions have directed daylight to be used, so when the full pastille dose is not desired, we may compare the tints by artificial light. This gives us a fair margin of safety, and is useful where we want to give repeated doses over an extended period.

When fractional doses are desired, we must arrange for our apparatus to work always under exactly the same conditions, and then note the time it takes to give the full pastille dose. If this should be sixteen minutes, a half dose could be given in eight minutes, and so on. Fractional doses may be given two or three times a week until a slight erythema occurs, but if the full pastille dose is given, it should not be repeated under fourteen days and not then if there is any definite reaction.

Whatever type of *x*-ray tube is used, a certain amount of difficulty will be encountered in getting it to work evenly, especially when new. If the current through it is below a certain strength, the tube will become gradually harder; if above, it will get soft through overheating. When the current is right for any particular tube, it will work for a long time without altering to any serious degree. The latter is the critical current, and should be ascertained at the earliest possible moment; having found it, the tube, if very soft, as most new tubes are, should be worked with a current very slightly less, until it has become as hard as we require. This may take minutes or hours to accomplish, but it is always worth doing, since the tube thereby acquires a state of stability that gives more even and certain results.

It must be remembered that the pastille dose given under the conditions described

above is the one used for treating ringworm, and is just sufficient to cause epilation but not permanent baldness. This we have spoken of as a standard dose. As we advance into the subject of radiotherapeutics, it will be found that radical departures from this standard must be made if we are to attack in a proper manner the various conditions that come to us for treatment.

We have referred to 'hard' and 'soft' tubes: the peculiarities of the 'soft' variety are a low vacuum and a low resistance; the rays from them have slight penetrating power, and, being absorbed by the superficial layers of the skin, readily set up radio-dermatitis: the action of a soft tube on the tissues is superficial but very intense. The rays from a 'hard' tube are more penetrating, but less active in producing reaction or dermatitis. Consequently, we must select our tube to suit the conditions present: if we want to reach a deeply seated part, a hard tube must be used, the distance from the surface must be increased, and the exposure varied as the square of the distance; this gives a more even irradiation of the deeper tissues. It is doubtful whether the pastille is quite reliable in this particular class of work, and it becomes less so when we resort to the use of filters for cutting out the less penetrating rays, or for making the pencil of rays more homogeneous.

When stating the peculiarities of soft and hard tubes, it should have been mentioned that rays of every degree of penetrating power come at the same time from every tube that is in a condition to give out *x* rays. The difference in the output of tubes of different degrees of hardness is, that in the case of a soft tube, for instance, the rays of low penetrating power predominate, but a few highly penetrating rays also are given off. Conversely, a hard tube gives off a preponderance of highly penetrating rays, and but few rays of low penetrability. When treating deeply seated parts, the rays of low penetrating power are not only not required, but are at times very inconvenient through setting up dermatitis, perhaps long before we have given the case as much treatment as we think advisable.

It was to meet this difficulty that the first attempts were made to interpose in the path of the rays some substance which would have the effect of absorbing the soft rays and yet have little or no influence upon the passage of the hard rays. Various substances have been tried, but the only popular one is sheet aluminium. Very useful thicknesses for general purposes are 0·33, 0·5, 1, 2, and 3 mm. The proportion absorbed by any given sheet of metal depends on the hardness of the tube. The softer the tube the greater the proportion that is filtered out. With a tube having a hardness of No. 7 Benoist, a sheet of aluminium of 0·33 mm. thickness will absorb approximately one-half of the output. Thus, if we use such a tube and a pastille properly placed, and interpose this thickness of aluminium, by the time the pastille has changed to tint B a half-pastille dose will have been given.

It should be remembered that the rays most prone to produce surface reaction are most easily absorbed by a filter, and for this reason it is possible to give a series of half-pastille doses at short intervals without danger; but half-pastille doses without filtration would be dangerous and unjustifiable.

The various modifications in dosage that may be carried out are very numerous, and would require too much space to describe in detail. The *x-ray filter* is of special use in the treatment of diseases of bone, leukæmia, and deeply seated tumours, such as fibromata. For very deep lesions the filter may be as thick as 5 mm. with advantage, but it will take about an hour to give an ordinary dose. The primary reaction that frequently follows a few hours after the application to a sensitive part, such as the face, may be prevented by interposing an aluminium filter only 0·3 mm. thick. On account of secondary radiation from the metal, the filter should not be placed too near the skin; midway between the tube and the skin surface is a good position.

It must be carefully remembered that the harder the tube the less active, therapeutically, are the rays from it; also that, when we use a filter, the rays most easily stopped by it are the more active ones. Consequently, in treating deeply seated lesions, exposures have to be very long, and the wear and tear on tubes is considerable.

It will be gathered from the foregoing that there are numerous difficulties to be overcome in learning the successful practice of *x*-ray therapeutics, and that many of them can be mastered only after considerable experience. Though it is possible to carry out some of the milder forms of *x*-ray treatment without much practice, such treatment is bound

to be of the rough-and-ready type, and not without risk. Anyone wishing to take the matter up seriously should attend a place where such work is carried on along proper lines and on a more or less extensive scale. The experience gained under such conditions will prove invaluable.*

Practical Application. — The suitability of any particular case for treatment by radiotherapeutics will depend on several circumstances, the chief of which is its anatomical relation to the surface of the body. It may be taken as an axiom that the more superficial the lesion, the more likely is it to be favourably influenced by the *x* rays. It thus happens that it is in the treatment of diseases of the skin that it finds its greatest field of usefulness, and it is fortunate that it is among these conditions, usually very resistant to the more ordinary methods of treatment, that its effects are the most striking.

As an instance of this, take the case of *acne vulgaris*: the way this can be made to

---

* Though written some years ago, the foregoing remarks are substantially correct at the present time, especially as regards the behaviour and management of the ordinary *x*-ray or 'gas' tube as it is now called. These are still constructed on exactly the same principles, but have been modified and improved in details. The older forms have been almost completely superseded by the large bulb, tungsten-faced, heavy anticathode type, in which exhaustion has been carried to a degree of 'hardness' that enables them to be used for almost any purpose in radiology without previous seasoning. A vacuum regulator of large capacity gives control over the radiation within fairly wide limits, and generally lasts out the life of the tube. The modern gas *x*-ray tube is a great improvement on those of but a few years ago, but it is no less necessary to exercise care when first put into service, and the precautions to be observed are supplied by the dealers when the tubes are sent out. Notwithstanding their relatively large size and high exhaustion, few will stand a current of 1 ma. for the fifteen minutes or more frequently required for *x*-ray treatment without excessive heating; but they will readily do this, and more, after more or less prolonged use for radiography or treatment of a less exacting character. Consequently if such a tube is to be used for 'deep therapy', as it is termed, it must first go through a process of seasoning essentially the same as already described. Having arrived at a satisfactory condition, the administration of full doses of highly penetrating rays through filters of 5 mm. or more of aluminium in something less than half an hour becomes a matter of routine.

Such tubes did much to extend the field of *x*-ray therapeutics, particularly in dealing with the more deeply seated lesions, with at times very remarkable and even highly successful results; but they still suffer from the faults of their class—common to all 'gas' tubes—in being both erratic and unstable.

It was to overcome these difficulties that Dr. Coolidge evolved the 'therm-ionic' tube, usually associated with his own name. An illustrated pamphlet giving full details of its construction and use may be had from any dealer in *x*-ray material, gratis on application, and need not be repeated here. Briefly stated, the Coolidge tube differs from the ordinary type in being exhausted to as near the absolute vacuum as is humanly possible—so that if it were attempted to use it as one of the ordinary kind no current could pass through it. In the ordinary or 'gas' tube the current passes by virtue of the residual gas within it; there being no such residual in the Coolidge tube, ions are set free from a filament of tungsten wire enclosed within the cathode and maintained at a high temperature by a current from an accumulator or other independent source. The number of ions available depends directly upon the temperature of the filament, and this may be regulated to give any degree of radiation at will, and varied while the tube is in operation. So long as the heating current remains constant the radiation from the tube remains likewise constant. Though the anticathode soon becomes red hot, even incandescent with large currents, it may be run continuously for hours without damage. It, moreover, acts as its own rectifier—reverse current being unable to pass so long as the temperature of the anticathode remains appreciably below that of the tungsten spiral.

It would be impossible to overstate the immense advantages this tube gives to *x*-ray therapy. Doses of an intensity and penetration are now readily given that were not possible before its advent, with results in many instances highly gratifying to all concerned. Not the least remarkable feature of this tube is the fact that it may be operated in an extremely 'hard' condition with very high potentials without fear of puncture. In an ordinary gas tube the risk of puncture begins when its resistance attains that of 6 in. of air, and as its resistance rises this risk of puncture increases much more rapidly, so that an 8-in. air-gap equivalent resistance marks about the limit that a gas tube may be worked with safety, and even then only with care. A Coolidge tube may be readily worked at a 9-in. air-gap resistance with as heavy a current and for as long a time as is likely to be required for any medical application. Indeed, some enthusiasts, both at home and abroad, are practising *x*-ray treatment with tubes at a resistance of 15 in. or more, and passing heavy currents from powerful apparatus. No ordinary coil or other type of transformer will stand the strain of such enormous electrical stresses, and many have been broken down and seriously damaged in the emulation of this procedure; this warning should not be ignored, especially as there is little or no evidence up to the present to show any advantage in working with tubes at a higher resistance than that of a 9-in. air-gap; this is quite within the capacity of any good modern coil or rectifying transformer.

clear up under a course of *x*-ray treatment is at times quite remarkable, and sometimes we find parts untreated getting well almost as soon as those that have been treated. It is this that has suggested the possibility of antibodies being set free and acting as vaccines. Another condition that responds very well is *psoriasis*. This disease is not permanently cured, but it rapidly clears up, even in patches that have not been directly exposed, and it is easily kept in hand by a few applications at intervals of a few months. As *x*-ray treatment does away with the use of the messy ointments usually prescribed, patients are very appreciative. *Chronic eczema* also is a disease that at times responds excellently. In all these we may give nearly full pastille doses at intervals of two or three weeks, or smaller doses may be given more frequently ; but care must be taken not to carry on the treatment too long or to set up *x*-ray dermatitis. The technique for the treatment of *ringworm* is described under its proper heading, and need not be repeated here.

With regard to *lupus vulgaris* the *x* rays are most useful in clearing the more active and ulcerative forms up to a certain point, when the improvement frequently fails to go further. At this stage the Finsen method comes in, and, if thoroughly done, a cure follows as a rule.

For *rodent ulcer*, pastille doses are given every two or three weeks and are very successful ; before each treatment the surface must be thoroughly cleaned with a small spoon.

Pruritus and *nervous itching of the skin* are relieved by *x*-ray applications ; the effect is due apparently to some influence on the nerve-endings. This relief of pain was one of the first things noticed in the treatment of painful cancers, and it has been tried in neuralgia with much success. Some writers have claimed good results in that very troublesome form of nævus known as the *port-wine stain*. In the milder cases it may answer, but it must be remembered that, if several more or less severe applications have to be given, there is a danger of telangiectases forming some months after which might be quite as unsightly as the original mark. The effect produced upon the inner coat of the small blood-vessels—thickening of the intima and narrowing of the lumen—is taken advantage of in dealing with *redness of the nose*. This condition is not only unsightly but, being frequently associated with alcoholism, is very distressing to those who suffer from indigestion and seldom if ever touch alcohol in any form—especially ladies. An application of *x* rays from a hard tube given two or three times a week for from five to ten minutes to each side, at a distance of about ten inches from the anticathode, is usually very successful. The case requires very close attention, and treatment must be suspended on the slightest sign of reaction.

Many of the first efforts to deal satisfactorily with *hypertrichosis* were not successful ; in fact, there were cases where the result was worse than the original condition. There is no reason, however, why this should be so now, and by following out a proper technique a good result can be obtained. If the case is one with a comparatively small number of long and strong hairs, it should be treated by electrolysis, as described under ELECTRO-THERAPEUTICS. The cases most suitable for *x*-ray treatment are those with numerous small hairs on the upper lip and chin of female patients. Electrolysis would be too tedious and would leave a large amount of scar tissue behind, so altering the texture of the part that we should get little thanks for all our trouble. Noire has elaborated a technique that in his hands appears to answer well. He gives pastille doses exactly as for epilation, except that he interposes an aluminium screen 0·4 mm. thick between the tube and the part under treatment. This has the effect of filtering out the rays that would otherwise be absorbed by the upper layers of the skin, and the brunt of the attack is borne by the hair follicles. The application is repeated at intervals of a fortnight at first, and later on of a month. From eight to ten applications are required, and the result is said to be permanent. The whole process must be carried out with care and skill if the result is to be satisfactory. Good results can also be obtained by giving fractional doses two or three times a week, using a suitable filter. This is based upon the permanent epilation that follows treatment for other conditions, such as lymphadenoma, where no reaction has occurred at any time, owing to the use of filters made by soaking lint in a saturated solution of sodium tungstate and drying on a horizontal flat surface to keep the distribution even. This was one of the earliest filters used, and answered quite well, but sheet aluminium of known and definite thickness is more scientific and satisfactory.

The same technique may be used in the treatment of *hyperidrosis*, with excellent results. When the condition is accompanied by an offensive smell, it is very distressing, especially for ladies : and until the *x*-ray method was employed no treatment had proved of much value.

Various forms of *neuralgia* are frequently relieved by a few applications of the *x* rays. Hard tubes are best, and the dose depends on the depth of the lesion, this also determining the thickness of the filter. Cases ranging in depth from a trigeminal neuralgia to sciatica are very frequently relieved—sometimes after a single application.

The enlarged thyroid gland that accompanies *exophthalmic goitre* responds to *x*-ray treatment very satisfactorily as a rule. A medium hard tube is used, with a filter of about 2 mm. of aluminium. The application is from one-third to one-half of a pastille dose, and may be given twice weekly at first. After a month or so shrinking is perceptible, and the gland gradually returns to about normal dimensions in favourable cases. The exophthalmos, dyspnœa, and palpitation also improve concurrently, and the patient returns to a more normal state.

Another condition that has been successfully dealt with is that of *tuberculous glands of the neck*. We must be careful to avoid anything like dermatitis, but treatment should be more or less bold. If it is carried out properly, a large proportion of cases can be cured to all intents and purposes, and operation avoided.

Deeper conditions, such as *tuberculous periostitis*, also respond well at times, but here we must use harder tubes and thicker filters, so that the lesion receives full treatment before the skin begins to suffer.

The method has likewise been found useful in *enlarged prostate*, bringing about a shrinkage of the gland and relief of symptoms. It is advisable to expose the testicles also in elderly subjects ; this causes atrophy and a physiological castration, with its attendant benefit in this condition.

The *x* rays have been much employed in the treatment of *leukæmia*, and if the only trouble in this disease were due to the presence of an excess of leucocytes in the blood, the method would be entirely satisfactory. It is a matter of common experience in the *x*-ray treatment of such cases that the blood-count is brought to normal or nearly so, and kept there by exposures at intervals, yet the patients are not by any means cured, though many of them appear to be benefited in a marked degree. It frequently happens that they die quite suddenly and for no apparent reason, the blood-count being practically normal at the time of death. Still, we know of nothing that has better results, and as the patient is often made to feel more comfortable, it may be worth trying in a proportion of cases. Most treatment has been applied to the spleen area, and after that to the ends of the long bones and the sternum. The spleen sometimes diminishes very rapidly in size, but the *x*-ray doses must not be heavy at first. Owing to the breaking up of a large number of cells, symptoms of severe toxin poisoning have followed vigorous applications. Many observers are now of opinion that the effect is chiefly on the blood itself, and that the treatment may be applied to any part of the body with equally good results, and there is much to be said in support of this view.

The *x*-ray treatment of certain forms of *uterine myoma* has now attained a recognized place in therapeutics. Diminution and arrest of hæmorrhage, relief of pain, and shrinkage of the growth have been observed so frequently that the method is gaining a popularity that seems to be deserved. The technique varies according to different authorities, but all use very hard tubes with a filter of 3 to 5 mm. of aluminium. Each application may be 1·5 Sabouraud, and nine of these may be given during the inter-menstrual period. This process may have to be repeated twice or three times before the relief is complete. The applications are to be made from as many different points as possible, on the 'cross-fire' principle, to save the skin from possible dermatitis.

With regard to the treatment of *malignant disease*, considerable progress has been made in recent years, and largely because of the more powerful and efficient apparatus provided. In fact the general tendency has been towards the administration of massive doses of highly penetrating rays through filters of gradually increasing thickness. It is, perhaps, too much to speak of modern methods of *x*-ray treatment as constituting a *cure* for malignant disease, but experience justifies us in saying that few of the various types of malignant cell can survive the full brunt of the bombardment that characterizes the

present-day course of *x*-ray treatment. The main difficulty of the radiologist is that so many of the cases referred to him are far advanced and inoperable, either from extension or locality. Speaking generally, there can be little chance of success where the spreading margin of the growth is protected by a large external carcinomatous mass. Fortunately there is a gradually developing co-operation between the surgeon and radiologist, and perhaps the day is not far distant when no case will be declared 'inoperable' in its present sense. It will then be the duty of the surgeon to remove all available parts of the growth and so enable efficient radiation to reach the advancing margin where it is most required. If the system is to be carried out consistently, the first massive dose will be applied on the operation table and before the wound is closed—a perfectly feasible procedure under modern conditions.

Even where this plan is not followed, there are very few inoperable cases that do not derive more or less benefit from a course of *x*-ray treatment. The shrinkage of the growth is at times very remarkable ; it is no uncommon experience to have a large foul ulcerating carcinomatous breast not only heal over but become a mere fraction of its former size, pain relieved when present, the general health vastly improved, and life prolonged under more or less comfortable conditions. Sarcomata seem to be more susceptible than carcinomata, especially the small round-cell variety. A large lymphosarcomatous tumour of the abdomen of a middle-aged man, declared inoperable after an exploratory incision, has completely disappeared under *x*-ray treatment, and restoration to health and work has been practically complete for the past two years. Another type of growth that responds well is the endothelioma ; nearly all that have come under our own observation have cleared up in a most satisfactory manner.

As a prophylactic measure every operable case should be subjected to a course of *x* rays as soon as possible after the operation, and repeated at gradually increasing intervals for a period of two years. This is being done in most cases at the present time, and there is a general agreement that the tendency to recurrence is definitely reduced Here, as in all other such cases, 'hard' tubes give the best results, and the filter should be not less than 2 mm. of aluminium. It is not too much to say that the case for the employment of the *x* rays or radium in every case of malignant disease at some stage is overwhelming ; but if the patient is to have the best chance it is essential that the work be carried out with the aid of the most efficient and modern appliances in the hands of one who has both skill and experience in this class of work. It is necessary to emphasize this point, as it is within our knowledge that many unfavourable cases have not been under the influence of an *x*-ray technique that could be described as *thorough*. It must be admitted, however, that cases are occasionally met with on which the *x* rays seem to have no favourable influence, however elaborate the methods employed ; but these are a diminishing quantity under present conditions.

A not infrequent cause of failure is over-protection of the surrounding parts. It is not generally realized how far the danger zone extends beyond the visible portions of the growth ; and unless the rays are allowed to spread more or less widely, dissemination goes on unchecked. It is only by irradiating the parts for a considerable distance from the affected area that we can get anything approaching control over this property of metastasis —probably the greatest difficulty with which we have to contend.

The *x* rays have been employed in numerous other diseases with varying success, but enough has been said to show that the method not only has a real value, but has established itself as an important factor in the treatment of many diseases. (*See also* RADIUM THERAPY.)

Reginald Morton.

RADIUM THERAPY.

TECHNIQUE.

Form of Radium Employed.—Radium is employed, in the treatment of disease, either in the form of radium salts or of radium emanation.

Radium salts are used in two ways, as follows :—

1. Distributed over flat, varnished applicators, rectangular, square, and circular, the superficial area of the various applicators ranging from 1 to 30 sq. cm. These may be :—

a. Full strength, containing an amount of radium sulphate equivalent to 10 mgrm. of radium bromide to each square centimetre.

b. Half strength, containing an amount equivalent to 5 mgrm.

c. Quarter strength, containing an amount equivalent to 2·5 mgrm.

2. In capillary glass tubes, filled with radium sulphate, closely packed so as to prevent any movement of the salt.

Radium emanation is also employed in two ways, thus :—

1. Collected in glass tubes or metal containers, and used with appropriate screens, exactly as the radium salts themselves are used—due regard being paid to the gradual fall in radio-activity resulting from the decay of the emanation.

2. Dissolved in distilled water, or in a weak saline solution, and administered by drinking or injection.

Screens.—The screens employed as filters for the different rays are :—

1. *Aluminium*, 0·01, 0·02, 0·04, 0·08 mm. thick. These are principally used with short exposures in the treatment of capillary nævi, pruritus, neurodermatitis, and superficial skin lesions.

2. *Silver*, 0·5 and 1 mm. thick. These are most useful as shields for the glass tubes of radium when introduced into tumours, and also in the treatment of keloid and vicious cicatrices.

3. *Lead*, 0·1, 0·2, 0·4, 0·5, 1, 1·5, and 2 mm. thick. Screens less than 0·5 mm. in thickness are valuable in the treatment of flat superficial epitheliomata, leucoplakia, fibromata, and granulomata.

Those exceeding 0·5 mm. are used when it is desired to employ the hard *beta* and *gamma* rays only, and to give prolonged applications without causing any surface irritation.

4. *Platinum*, 0·3 mm. in thickness, is most generally useful as a screen to tiny but extremely powerful emanation tubes, which are buried in small malignant growths in the neighbourhood of the mouth, fauces, and air-passages, as the screening power of 0·3 mm. of platinum is about equivalent to that of 1 mm. of silver.

Duration of Applications (Exposures).—1. *Very short exposures*, of from three to fifteen minutes' duration.

These are called for generally in the treatment of superficial cutaneous lesions, such as chronic eczema, lichenification, psoriasis, etc. 'Half-strength' applicators, unscreened, are generally employed, and in the few instances where screening is resorted to this should not exceed 0·01 mm. of aluminium.

2. *Moderate exposures, unscreened*, from half an hour to one and a half hour's duration. Usually employed in the treatment of very superficial small capillary nævi, keratomata, warts, corns, papillomata, and the early stages of rodent ulcer. 'Half-' or 'full-strength' apparatus is used.

3. *Long exposures, unscreened*, from one and a half to three hours' duration. These are resorted to when it is necessary to produce a definitely destructive reaction ; as for example, in the treatment of hypertrophic or deeply ulcerated rodent ulcers, small localized epitheliomata, pigmented moles, etc. 'Full-strength' apparatus are usually employed.

4. *Moderate exposures, screened.* The screening employed is either 0·1 mm. of lead or 0·5 mm. or 1 mm. of silver, and the conditions which demand this kind of treatment are cavernous nævi, keloids, vicious cicatrices, flat superficial epitheliomata, indolent ulcers and inflammatory induration of recent origin. 'Half-strength' applicators are most useful.

5. *Very prolonged exposures, screened.* These are adopted when it is considered advisable to use only the gamma radiation. The screening should be not less than 1·5 mm. or 2 mm. of lead, the latter being the usual thickness. With apparatus screened in this fashion, prolonged exposures of twenty, thirty, or forty hours or even longer are frequently given, though it is advisable to change the site of the apparatus at intervals of not more than twelve hours to minimize the tendency to the production of superficial vesication.

Tube Exposures.—Speaking in general terms, when radium salt or radium emanation tubes are actually buried in the substance of a tumour, screening of 1 mm. of silver is employed, and an exposure of twenty-four hours' duration given, but the strength of the tube and the length of the apparatus must be calculated in accordance with the dimensions of the growth.

Screens, Appliances, and Methods of Application.—A varnished applicator is always covered with a thin layer of rubber sheeting, thus effectively protecting it from contact

with any excretions or moisture, and avoiding the necessity of repeatedly cleaning the apparatus.

When silver or lead screens are used, the passage of the gamma rays through these metals gives rise to secondary rays which are very irritating, though their action is superficial only, and it becomes necessary to absorb these rays. With this object, from six to twenty-four sheets of black photographic paper and one or two layers of lint are interposed between the metal screen and the outer rubber covering. When tubes shielded with lead or silver screens are introduced into the vagina, rectum, uterus, etc., they are enveloped in rubber tubing of 3 mm. thickness for the same purpose. These secondary rays vary greatly in amount, according to the nature of the metal and the thickness of the screen employed.

The lesion to be treated is gently cleaned and dried, and all crusts or flakes of secretion are removed. The healthy skin and tissues surrounding the lesion must be carefully protected by a layer of lead-rubber sheeting—similar to that used in *x*-ray work—an aperture being cut in the sheeting the exact size and shape of the lesion. For external lesions, the apparatus is best fixed in position with some non-irritant adhesive rubber plaster.

To retain tubes in the vagina or uterus, the employment of a tampon is generally necessary. In the rectum, and nasal and buccal cavities, the apparatus is attached to a handle of thick silver wire, which can easily be bent and fastened to the gluteal fold, cheek, or ear by adhesive plaster.

THE REACTION.

All tissues when treated with radium respond in some manner, but the nature and extent of this response vary very greatly, and depend upon :—

1. *Apparatus, screening, and dosage employed.*

2. *Nature of the tissue treated.*—Mucous surfaces are more responsive than the glabrous skin, and in them the reaction appears earlier, is more definite, and lasts longer. There is also difference to be noted between dry and moist surfaces ; for example, in the axillæ and inguinal folds, vesication occurs more readily than elsewhere.

Tissues of a definitely pathological character—carcinomatous or sarcomatous—do not display the same resistance to radium as normal cells, and upon the correct appreciation of this fact successful radium therapy largely depends.

3. *Condition of the tissues treated.*—Tissues which have previously received much *x*-ray or ionization treatment, or been subjected to the action of CO_2 snow, or cauterization, need to be treated with care and caution, as any over-dosage may result in extensive breaking down of the old scar tissue, the process extending far beyond the area over which the patient has to be treated. The reaction in patients who suffer from locomotor ataxy, syringomyelia, paralysis, or any other disease affecting the functions of the trophic nerves, is often atypical and excessive. A similar phenomenon is observed in areas of which the trophic nerves have been destroyed by some previous injury, such as a burn.

The elaborate and extensive dissection associated with Wertheim's hysterectomy appears seriously to impair the vitality of the pelvic tissues, so that exposures given within three or even six months of this operation must be very carefully considered.

4. *Extent of the area treated.*—The reaction is dependent not only upon the strength of the applicator, but also upon its surface area. For example, the reaction from an applicator of 'half strength' applied over an area of 6 square cm. for an hour varies but little in degree from that obtained from a 'quarter strength' applicator, 16 square cm. in area, applied for a similar time.

5. *Personal idiosyncrasy.*—This is important, and is often responsible for curiously puzzling results. Persons of a highly neurotic temperament are undoubtedly more susceptible than those of a phlegmatic type, and all reactions are likely to be much more profound in the former than in the latter. This phenomenon is especially well seen in the treatment of some uterine conditions, and the greatest caution should be exercised on first treating a patient of the former type for menorrhagia, leucorrhœa, etc., and it is advisable to start with about one-half the dose that would be given to the other class of patient.

Patients who suffer from freckling, or exhibit unusual susceptibility to actinic rays, frequently develop marked pigmentation of any radium-treated areas after a lapse of several months. It is advisable therefore not to treat such cases too vigorously, or at too

short an interval, more especially if the condition be situate on exposed portions of the body.

Nature of Reaction.—The reaction usually appears between the seventh and fifteenth days, and may vary in character from a slight erythema to a destructive ulceration.

Four degrees may be clearly distinguished :—

(1) Simple erythema ; (2) Erythema followed by desquamation ; (3) Vesication with superficial ulceration ; (4) Deep ulceration, sometimes accompanied by the production of an eschar.

With some patients the time of reaction is much delayed, while with others the response is exceedingly prompt, and it is difficult, if not impossible, to say why this difference should be. It is particularly noticeable in the treatment of capillary nævi, and cases have been seen in which, instead of the reaction appearing on about the seventh or eighth day, it has been evident three days after the exposure ; in others a period of four weeks has elapsed before any effect has been perceptible ; though in all of these cases the applicators employed, the screening, and the times of exposure have been identical.

The increased susceptibility to changes of temperature over areas that have been treated with radium is very remarkable, and many patients who have had rodent ulcers and superficial skin lesions cured with radium state that they experience great discomfort at the site of the old lesion when very cold or very warm air plays upon it. This susceptibility, however, gradually returns to the normal in two or three months.

A very marked condition of lethargy is frequently, it might almost be said invariably, noted in patients receiving prolonged exposures with large quantities of heavily screened radium. It generally makes its appearance about the fourth day of the treatment, and passes off within a few days of the cessation of the exposures.

THE TREATMENT OF DISEASE.

Carcinomata.—

Squamous-celled Carcinoma (Epithelioma) of the Skin.—Very different results are obtained with epitheliomata affecting the glabrous skin as opposed to those involving mucous surfaces.

Epitheliomata of the face, trunk, or extremities, if flat and superficial, and accompanied by little or no ulceration, give satisfactory results when treated with quarter- or half-strength apparatus, screened with 0·1 mm. of lead, the exposures varying from six to eighteen hours' duration, spread over a period of three or four days. The retrogression of the growth is quickly brought about, and little or no scarring results.

Ulcerating epitheliomata, without much subjacent infiltration, require treatment with quarter- or half-strength apparatus applied unscreened, for a total exposure of two to six or eight hours, spread over a period of four or five days, and repeated after an interval of six weeks if necessary. A destructive reaction follows, but the result is usually quite good, and there is but little cicatricial contraction.

Ulcerated epitheliomata, with great infiltration, require prolonged treatment with heavily-screened apparatus emitting 'ultra-penetrating' rays. Exposures of thirty to sixty hours, given during one week, and repeated in five or six weeks' time, are best ; but if the growth show signs of rapid extension, the borders should be given a vigorous treatment with unscreened apparatus.

Epitheliomata in Association with Mucous Membranes.—Epitheliomata of the tongue and of the buccal, gingival, and pharyngeal mucous membranes, are almost uniformly disappointing in their ultimate response to radium therapy. Temporary improvement is not infrequently seen, and this sometimes goes as far as disappearance of the original lesion ; but the treatment has practically no effect in preventing or delaying the appearance of metastatic deposits in the cervical glands and elsewhere.

The rate of growth of the infected glands can often be retarded by the prolonged and persistent use of the 'ultra-penetrating' rays. If the dose given be a large one, the glands sometimes break down and discharge a milky-white fluid through a small sinus, and it is remarkable that ulceration of glands thus treated rarely occurs.

Considerable difficulty is experienced in giving satisfactory exposures within the oral cavity, as patients are often unable to tolerate the presence of applicators in their mouth for the necessary length of time, and, should the reaction be at all pronounced, the

congestion of the tissues occasions great discomfort. There is the further danger that a severe reaction may act as a stimulus to the original growth, increase its size, and hasten metastasis.

A method of treatment has recently been introduced which is well worth a trial in suitable cases of cancer of the tongue; it consists in burying within the carcinomatous nodule a small, but intensely powerful, radium emanation tube, possessing an initial activity equivalent to 80 or 100 mgrm. of radium bromide, enveloped in a screen of 1 mm. of silver or 0·3 mm. of platinum, and giving an exposure of twenty-four hours' duration. A fairly severe reaction results, and in some cases the nodule ceases to grow, and becomes replaced by dense fibrous tissue.

Epitheliomata of the Vaginal and Uterine Mucosa.—These conditions are more amenable to the action of radium, and satisfactory results are often obtained.

Small primary growths of the vaginal mucosa, unaccompanied by much deep infiltration of the vaginal tissues, may be completely eradicated by treatment with full-strength or half-strength apparatus, with an unscreened exposure of one to three hours.

With larger ulcerated and deeply infiltrating growths, radium is best applied heavily screened, and with prolonged exposures of from thirty to sixty hours, extending over a week or ten days. This frequently checks the rate of growth, heals the ulceration, and lessens the amount of infiltration.

Secondary non-ulcerated deposits in the cellular tissue of the vagina often respond extremely well to treatment with the 'ultra-penetrating' rays, and in some instances the deposits completely disappear.

Carcinoma of the Uterus.—In cases of inoperable malignant disease in this situation, radium will often bring about results which cannot be attained by any other known method of treatment. The hæmorrhage is arrested, the discharge is diminished in amount and rendered inoffensive in character, the ulceration is healed, and the pain is greatly relieved. The rate of growth is checked, and sometimes completely arrested; and the surrounding infiltration and induration are so much lessened that, in a few instances, cases previously declared to be inoperable become operable.

The treatment is best carried out by the introduction of a tube containing 100 to 250 mgrm. of radium, screened with 2 mm. of lead and 3 mm. of rubber, into the cervical canal, or, if this be not practicable, into the posterior fornix, a large flat strong applicator screened with 2 mm. of lead being placed on the abdominal wall over the fundus of the uterus. The exposure should be of twenty-four hours' duration, and may be repeated at intervals of not less than six weeks, if necessary.

Circumscribed and indurated nodules of small size in the substance of the cervix may receive, in addition, treatment by the insertion into their substance of tiny emanation tubes of 20 to 30 mgrm. initial activity, screened with 0·3 mm. of platinum, for from twelve to eighteen hours.

The action of radium is, however, only local, and though it may, and often does, check the rate of growth, yet, in most cases, dissemination will sooner or later occur, and the disease spread to parts beyond the effective range of radium.

Great caution must always be observed in treating recurrence in the vagina within six months of the performance of a Wertheim's hysterectomy. The extensive and elaborate dissection which is unavoidably associated with the performance of this operation appears seriously to impair—for some few months at least—the functions of the trophic nerves of the pelvic contents; and a treatment within the vagina, of a strength and duration which might quite safely be given under ordinary conditions, may be followed by an intense and severe destructive reaction. It is, therefore, inadvisable to use more than 100 mgrm. of radium bromide; and the exposure should not exceed twenty hours' duration, which should be spaced over four or five days. A lead screen, 2 mm. in thickness, should be employed, and the non-affected portions of the vaginal wall carefully protected with gauze packing.

Carcinoma of the Rectum and Intestine.—Radium therapy not infrequently proves of considerable value in the treatment of these carcinomata, but it is extremely difficult to say what are the factors which determine, or contribute to, the success of the treatment.

Speaking in general terms, the application of radium results in the arrest of hæmorrhage, the healing, partial or complete, of any ulcerated surface, a diminution of the

amount of the discharge, less pain, and a retardation of the rate of progress. In some instances more striking changes manifest themselves. The growth shrinks in size, undergoes a fibrous transformation, and becomes much less fixed to the underlying tissues; so that a carcinoma, which before radium treatment was regarded as inoperable, can be easily and completely removed.

A few patients manifest an unusual degree of susceptibility to radium when applied within the rectum, and a relatively short treatment of eighteen to twenty-four hours with heavily screened radium is followed by a severe, though transient, proctitis.

The cases which are most favourable for radium treatment are those in which the growth is annular in type, and situated in the upper half of the rectum; though a successful result, in these instances, means the production of a fibrous stricture at the site of the original growth.

If extensive ulceration be present, even though the danger of obstruction may seem remote, the patient should be advised to submit to the performance of colostomy before radium treatment is undertaken, as the passage of fæces over an ulcerated surface, the tenderness of which has been intensified by a radium reaction, is very painful.

The routine treatment of cases of rectal carcinoma consists in the introduction into the lumen of the growth—if such exist—or the placing in accurate apposition with the affected area, of a tube of 100 to 200 mgrm., screened with 2 mm. of lead, and giving an exposure of from fifteen to thirty hours' duration according to the strength of the tube. The dosage should not exceed 3000 mgrm. hours, and the exposure should not be repeated at an interval of less than two months.

Special care should be taken to protect the healthy mucous membrane as far as possible from the radium rays.

Carcinoma of the Stomach.—Inoperable cases of cancer of the stomach may be treated with radium, not in the hope of cure, but with the object of checking the growth and alleviating the symptoms.

Some slight degree of benefit usually results from the application of powerful apparatus, screened with 2 mm. of lead, over the gastric region, the pain being lessened, the frequency of vomiting decreased, and the general health improved.

Carcinoma of the Breast.—The results of radium therapy in the treatment of cancer of the breast are, on the whole, encouraging; and this is especially the case when the primary growth is of the sclerotic rather than of the medullary type, and when the secondary deposits occur in the skin lymphatics and lymphatic glands, and there are no internal metastases.

Radium should never be used as a substitute for operative interference; but, when the case is inoperable, it will do much to relieve pain, promote the healing of ulcerated surfaces, and check the growth of the secondary deposits. In not a few cases it will bring about the almost complete absorption of superficial carcinomatous nodules and infected glands. Instances have been noted in which the physical signs were strongly suggestive if not positively indicative, of carcinomatous deposits in the lungs; and the prolonged application of from thirty to forty hours of a large quantity of radium, screened through 2 mm. of lead, has brought about an apparent resolution. In rapidly-growing cancers of the encephaloid type, radium can do little but relieve pain. The post-operative lymphatic engorgement of the arm on the affected side is sometimes distinctly benefited by the application of a heavily-screened tube of 50 to 100 mgrm. of radium, placed at the apex of the axillary cavity, an exposure of twenty-four to thirty hours, spread over five days, being given.

Paget's Disease.—The external lesion of this condition is generally healed rapidly by radium, an hour's exposure to a half-strength applicator, unscreened, usually producing the desired effect. The disappearance of the skin lesion must not, however, be regarded as an indication of the cure of the disease, which will steadily progress to a fatal termination unless operative interference—or, if this is impracticable, heavy dosage with screened radium rays—be adopted.

Rodent Ulcer.—This is, of all forms of malignant disease, the one which is most amenable to the action of radium. Untreated rodent ulcers, not exceeding 2 cm. in diameter, and not affecting mucous membrane, cartilage, or bone, almost invariably yield to one exposure of one to three hours' duration with a full-strength unscreened applicator

If the ulcer occupy a large superficial area—say, 20 sq. cm. and upwards—an unscreened application over the whole area at the same time is inadvisable, in view of the severe systemic disturbance which would follow such a procedure; and the lesion should be treated by two, three, or four applications, applied in rotation to different parts of its surface, at intervals of three weeks or a month.

When a mucous membrane is affected, rodent ulcers prove much more refractory; though an exception should, perhaps, be made in regard to the palpebral mucosa, as small rodent ulcers in this situation often respond well to exposures of strong unscreened apparatus, of fifteen to twenty minutes' duration, given consecutively for three days.

If the rodent ulcer has attacked cartilage, great care must be exercised not to give too heavy an exposure, or a very acute, painful, and prolonged inflammation may be produced.

Radium appears to have no power to cure a rodent ulcer once it has invaded the bony tissues, and for this reason affected portions of bone should be excised before radium treatment is commenced.

When the extent, position, or character of the ulcer precludes the possibility of strong unscreened exposures, the best results will probably be attained by prolonged exposures with heavily-screened apparatus, using the 'ultra-penetrating' rays only. This method is followed by little or no active inflammatory change, and, in addition, often alleviates the pain of the ulcer in a very definite manner. The action of radium in these cases can be greatly aided by judicious skin-grafting as soon as the base of the ulcer has assumed a healthy appearance.

Many of those ulcers which have received treatment extending over a period of many years with x rays, zinc ionization, CO_2, etc., respond badly to radium treatment; and it is unwise to attempt to make any pronouncement as to the probable result. Quite frequently the previously treated tissues break down to an extent which far exceeds the existing ulceration, and repair is very slow and imperfect.

For the purpose of prognosis rodent ulcers may be classified into two well-marked clinical types: (1) The nodular and hypertrophic form, with but slight and superficial ulceration. This responds well to radium treatment, and yields the most satisfactory results. (2) The excavated form, with undermined and overhanging edges and a gelatinous base. This is always difficult to cure, and not infrequently proves intractable to all methods of radium therapy. —

Sarcomata.—These tumours exhibit many variations in the microscopical characters of their cells, and their response to radium therapy also differs to a considerable extent.

The periosteal usually respond better than the endosteal varieties, and the growth formerly termed myeloid sarcoma, but more recently myeloma, acts in a bewildering fashion; about 50 per cent of myelomata are not affected at all by radium, and in the other 50 per cent the result is gratifying. It is hard to say why this should be so, and the microscopical examination of the contained cells has so far afforded no information on the matter. It is worthy of note that periosteal sarcomata which do respond to radium treatment appear to have their malignancy destroyed, and the tendency to recurrence or dissemination is greatly inhibited, the patients remaining 'apparently cured' for many years.

From the point of prognosis the 'spindle-celled' varieties are to be preferred. The small 'round-celled' is not so favourably affected, whilst the large 'round-celled' appears to occupy an intermediate position.

With regard to the melanotic sarcomata, disappearance of the primary growth may often be brought about, and the disease temporarily arrested. In some cases so long a time may elapse as to excite false hopes in the patient and his medical attendants. Radium treatment, however, appears powerless to prevent the ultimate dissemination of the disease, which eventually progresses rapidly to a fatal termination.

Sarcomata of the nasopharynx are extremely susceptible to radium, and often completely disappear within a month.

The lymphosarcomata attacking the cervical and mediastinal glands usually show a very rapid and pronounced improvement, persisting for four or six months. In most cases some recrudescence of the condition is then noted, necessitating further exposures, which may have to be repeated at prolonged intervals for three or four years. A time

is, however, ultimately reached when the response becomes negligible, and the disease then rapidly assumes the mastery.

With sarcomata it is imperative to give a massive dosage, and whenever practicable the actual burying of silver-screened tubes within the centre of the mass, supplemented by the external application of powerful applicators, screened with 2 mm. of lead, should be adopted. The rapid diminution in the size of growths thus treated is productive of a very definite autotoxæmia, with languor, nausea, and a rise of temperature. This, however, rapidly disappears if the patient be kept at rest, and laxatives and diuretics judiciously employed.

Endothelioma.—This class of growth is most frequently met with as a tumour of the parotid gland, and when operation is impracticable radium is often of great value, the growths being reduced in size and their progress arrested. It is best, however, to subject these tumours to prolonged radiation with heavily-screened apparatus applied externally, and not at first to attempt treatment by the actual insertion of a screened tube into their substance. If any actively secreting portion of the parotid gland be in contact with the tube track there is always the possibility that a sinus may form at the spot where the tube is inserted. This sinus is kept open by the action of the parotid secretion, and a slow progressive ulceration starts which defies all efforts of repair. If, however, the growth be a recurrent one, all parotid substance having been removed at the previous operation, the burying of radium tubes may be resorted to safely.

Another favourite site for the development of this class of tumour is the neighbourhood of the carotid body, and in these instances the use both of buried tubes and external applicators is to be advocated; the results are frequently most gratifying.

Nævi.—

Flat Superficial Nævi (*Capillary Nævi*, '*Port-wine*' *Stains*).—These are the most difficult of all nævi to treat, and much care and patience must be exercised in order to bring about a satisfactory result.

The factor of personal idiosyncrasy is always prominent, and it is exceedingly difficult to lay down any definite rules as to strength and duration of exposure. It is best to proceed with great caution, giving a short, unscreened exposure, and, if necessary, gradually increasing the same until a satisfactory reaction has been obtained. As a general rule, apparatus of quarter or half strength should be used, the screening should not exceed 0·02 mm. aluminium, and the exposures should range from ten to sixty minutes' duration. These exposures should be repeated at six-weekly intervals, until the skin has assumed a salmon-pink tint. Screens of 0·1 mm. of lead should be used on subsequent occasions, and exposures increased to one or one and a half hour's duration.

In spite of all these precautions, however, the tendency to the appearance at a late stage of telangiectasis or pigmentation must always be borne in mind, and for this reason the child should be inspected at fairly frequent intervals for some time, so that the sequelæ may be dealt with promptly. The best results can be looked for when the nævus is quite superficial and shows no tendency to infiltration. If much infiltration exist, the treatment will have to be much more vigorous, and a destructive reaction of slight degree produced. A smooth, supple, and white scar will be left.

Cavernous Nævi.—These lesions are frequently particularly suitable for 'cross-fire' treatment, and in such cases good results can generally be expected.

Half-strength applicators should be used, with screens of 0·1 mm. lead, and exposures of from twenty minutes' to one hour's duration, given daily for three consecutive days, and the series repeated in a month's time. Under this method of treatment, the nævus slowly and steadily shrinks, and the process is unaccompanied by any surface irritation.

Keloid.—The results obtained with radium in the treatment of this condition are admirable. Keloids of recent formation, and occurring in young subjects, are the most easily cured. Applicators of half strength should be employed, with screens of 1 mm. silver, and an exposure of from fifteen to twenty hours given, extended over three successive days. The series should be repeated at intervals of six weeks. By this method of treatment a steady and gradual return of the tissues to the normal is produced, without any surface irritation.

Small elevated and rapidly growing keloids may be safely treated by a single exposure of one to one and a half hours' duration, with a half-strength unscreened

pparatus. The resultant scar is usually quite smooth and supple, and shows no tendency to further keloidal formation.

Parotid Tumours.—These growths appear to be peculiarly susceptible to radium, nd in almost every instance distinct improvement, frequently going on to apparent cure, s observed. The treatment must, however, be lengthy, and much patience and persevernce are needed to bring about a successful result. Applicators of half or full strength hould be employed, and screened with 2 mm. of lead ; the tumour should, if possible, be overed over its whole extent, and the exposures should be of not less than thirty hours' uration, extended over five days. The series of exposures should be repeated at intervals f six to eight weeks as long as is necessary.

Fibroid Disease of the Uterus.—The symptoms of this condition—menorrhagia nd metrorrhagia—are almost invariably greatly improved by radium treatment, and his improvement is sometimes supplemented by distinct diminution in the size of the terus. The best results are seen when a 'cross-fire' irradiation is resorted to, a 100-ngrm. tube, screened with 2 mm. of lead, being inserted within the uterine cavity, and plate containing 100 to 150 mgrm. of radium, screened in similar fashion, applied on he abdominal wall over the fundus uteri. The total exposure should be from twenty-our to thirty hours. In some cases the immediate effect is an increase of the amount ost at the next period, but with successive periods there is a steadily progressive diminuion. Treatment should be repeated at intervals of three to four months, and if the xposures have to be given on three or four occasions the probability of premature induction of the menopause must be made clear to the patient.

Chronic Metritis.—This peculiarly intractable condition, which so often defies all neasures short of surgical interference, often responds in the most gratifying fashion to adium therapy, and the operation of hysterectomy is averted. The treatment is identical ith that for uterine fibroids, and the same caution with regard to the premature establishment of the menopause must be observed.

Tuberculosis.—

1. *Lupus Vulgaris of Skin.*—Finsen light is usually to be preferred to radium in the reatment of cases of lupus vulgaris. When patients show themselves refractory to the ormer method of treatment the latter will often give excellent results. Both screened nd unscreened applicators are usually necessary, the latter when dealing with ulcerated, nd the former when treating indurated, areas. Silver screens 0·2 mm. in thickness are ometimes of value in the treatment of superficial ulcerated lesions ; 'half-strength' applitors are employed, the length of the exposure being from two to three hours. n lesions of long standing, with dense infiltration and distinct 'apple-jelly' nodules, prolonged treatment with screens of 2 mm. of lead should be adopted.

Cases affecting the mucous membrane of the nose seem particularly suitable for adium therapy, the position being one in which the satisfactory use of Finsen light is npossible. Tubes of 25 or 50 mgrm., screened with 1 mm. of silver, are applied inside he nose, in actual contact with the diseased surface ; this is supplemented with a 'full-rength' applicator, screened with 2 mm. of lead, and applied over the exterior of the ose. An exposure of six hours is given, repeated, if necessary, after six weeks.

2. *Lupus Vulgaris of the Palate and Fauces* may often be greatly improved by adium, but as the patients are unable to tolerate the presence of an applicator in the outh for any considerable time, 'full-strength' unscreened apparatus is used, and expoures of between thirty and sixty minutes' duration are given. A fairly vigorous reaction produced, which is generally followed by the development of healthy scar tissue and he arrest of the progress of the disease.

3. *Tuberculous Adenitis.*—As many patients are strongly opposed to operation when he glands in the cervical triangles are affected, by reason of the scarring which occurs, he employment of radium as an alternative is to be recommended ; and if adopted in an arly stage, before numerous glands are affected and caseation has occurred, favourable esults may be anticipated with some confidence. Prolonged exposures with heavily-reened applicators should be employed, special care being taken to eliminate all chance irritation from the 'secondary excited' rays, as pigmentation appears to be particurly prone to occur in these patients. As a result of the exposure the glands become uch smaller, and in many cases the disease is arrested by an encapsulating fibrosis.

Exophthalmic Goitre.—In the early stages of this disease, before profound nutritional changes are apparent, the employment of radium therapy as an adjunct to the routine medical treatment is strongly advocated. In most cases a definite decrease in the size of the thyroid, with striking symptomatic improvement, results. Prolonged screened treatment with 200 or 300 mgrm. of radium is called for, and the patient's medical attendants should be warned that the first effect of the treatment may quite possibly be an exacerbation of all the symptoms, lasting perhaps for two or three weeks. This phenomenon is occasioned by an increased influx of the thyroid secretion into the blood-stream; the disturbance, however, gradually passes off, and definite improvement manifests itself. In very susceptible patients one series of exposures may be sufficient; in others, treatment may have to be repeated at intervals of three or four months. In very advanced cases, associated with extreme tachycardia, great wasting, frequent vomiting, or diarrhœa, results are not nearly so good. The treatment must be undertaken with great caution, and the effects carefully watched, as harm may result if the dosage be at all excessive.

Leucocythæmia.—

1. *Splenic.*—As operative measures for the treatment of this condition are steadily coming into favour, and radium irradiation has been found to exercise a very rapid and definite effect upon the size of the spleen, it is now advisable to subject patients suffering from splenic leucocythæmia to this form of treatment before the operation of splenectomy is performed. A large quantity of radium, 400 or 500 mgrm. of radium in all, should be used, with screens of 2 mm. of lead, and an exposure of twenty-four to thirty hours' duration. This is usually followed by an extremely rapid decrease in the size of the organ. Cases have been noted at the Radium Institute in which the lower border of the spleen, when first seen, reached well below the level of the umbilicus, and within four weeks of the treatment it had receded to the costal margin of the same side, enabling the removal of the spleen to be performed with comparative ease a few days later.

2. *Lymphatic.*—This form of leukæmia is not so favourably influenced as the splenic variety, but much may be done by radium therapy to reduce the size of the affected lymphatic glands and to improve the patient's blood condition and general health. Patients need, however, to be kept under fairly constant observation, as recrudescence of the disease invariably occurs after a few months, necessitating further exposures. So long as the condition remains confined to the cervical, axillary, and inguinal glands, comparatively favourable results may be hoped for, but once the mesenteric and pelvic glands become infected the prognosis is bad, and the patients rarely survive for more than a year.

Lichenification of Skin.—This peculiarly intractable form of skin lesion is quickly cured by short exposures to half-strength applicators, unscreened, or screened with the thinnest aluminium; the relief afforded to the intolerable irritation is often marked within twenty-four hours. Cases so treated show little or no tendency to relapse.

Pruritus.—Radium is undoubtedly of great use in this condition, especially if it be of long standing and associated with leucoplakia or hyperkeratosis. When no actual lesion exists, and the trouble is purely nervous in character, the results are not so satisfactory, and often but little benefit follows from the application.

No definite rules can be laid down for treatment, as the local conditions vary so greatly; but the screening and exposures must be adjusted in relation to the character of the lesion.

Chronic Eczema, Psoriasis.—These conditions generally yield readily to short unscreened exposures with quarter-strength apparatus, applied for two or three minutes on three successive days, the exposure being repeated after a week or fortnight if necessary.

With chronic eczema the cure may be permanent; but in psoriasis the patches tend to recur sooner or later, and require further treatment.

Lupus Erythematosus.—This very intractable condition, which so often defies all treatment, is usually greatly improved by radium. Care must be taken not to give too strong a dose, and the best results usually follow the use of a quarter- or half-strength applicator, sufficiently large to reach well beyond the borders of the lesion, unscreened or screened with 0·01 mm. aluminium, and an exposure of forty to sixty minutes' duration.

Arthritis Deformans.—This extremely obstinate, progressive, and crippling malady is not infrequently strikingly benefited by the daily drinking of 250 c.c. of radium emanation solution, of a strength of 1 to 2 millicuries per litre. The treatment must, however

be persisted in for quite a long time, and at least six weeks are likely to elapse before any change is noted. In a favourable case the articular and muscular pains are lessened, or disappear; the movements of the affected joints become much freer, and are accompanied by less grating; the muscles controlling the joints regain much of their lost tone; and the general health of the patient is greatly improved. With the majority of the patients the emanation solution produces a definite diuresis, and with a few it acts as a slight laxative, though free purgation has never been noted.

In cases with a markedly gouty history, the first effect is often to cause an acute exacerbation of symptoms; but this is not to be regarded as a contra-indication to treatment, and the taking of the solution must be steadily persevered with.

It is difficult to predict with certainty which patients will derive the greatest benefit; but relief is most likely to be obtained when the patient is under fifty, and when the disease is polyarticular in distribution, and peri-articular in character. Ankylosis, the presence of osteophytes, or osseous changes of any kind, militate very strongly against successful treatment, and but little good is to be expected.

Post-operative Prophylactic Irradiation is now often resorted to by many surgeons when the patients have suffered from extensive, severe, and rapidly progressive malignant disease and the probability of their remaining free from recurrence for more than a few months has been but slight. The results so far noted do much to justify the routine adoption of post-operative irradiation, especially in those cases of malignant growth where it has been found impossible to operate well beyond the appreciable area of the disease.

A. E. Hayward Pinch.

RANULA.—This is a name given to a cyst found on the floor of the mouth, apparently due to blocking of a salivary duct, or a duct of one of the smaller glands, such as those of Nuhn and Blandin, or even of one of the mucous glands.

In treating the condition, it is necessary to perform some operation which will prevent recurrence. If the cyst is simply dissected out and the wound closed, the condition is almost certain to recur, for the minute duct of the affected gland will still be left without an opening. The same result will follow if the cyst be opened and scraped and allowed to granulate up. The simplest method is to remove the whole of the anterior wall of the cyst, and then to suture the floor of the cyst to the surrounding mucous membrane of the floor of the mouth. By this means the floor of the cyst forms a part of the floor of the mouth, and on to it will open the duct of the affected gland.

Albert J. Walton.
(Revised by E. C. Lindsay.)

RAYNAUD'S DISEASE.—(*See also* CHILBLAINS, ELECTROTHERAPEUTICS, GANGRENE, and BLACKWATER FEVER.)

1. **Preventive Treatment.**—The patient should avoid undue exposure to cold. In severe cases it may be necessary for him to winter abroad, or at any rate to remain indoors during cold weather; he should be warmly clothed in flannel, and wear wide, thick boots, and loose, warm gloves; he should wash only in water at blood heat. The dietary should be abundant and contain plenty of meat and fat. From time to time a course of tonics, especially cod-liver oil and iron, is beneficial.

2. **Medicinal Treatment.**—Quinine should be given if there be a history of malaria, in doses of 10 to 20 gr. per day. Opium is to be specially recommended in middle-aged or elderly persons who suffer from daily painful paroxysms with a tendency to gangrene. It may be given in doses of $\frac{1}{3}$ or $\frac{1}{4}$ gr. in pill thrice daily, or $\frac{1}{4}$ gr. of the extract may be given with 2 gr. of extract of hyoscyamus. If there be any suspicion of a syphilitic taint, iodides should be given a fair trial.

3. **Electrical Treatment.**—Galvanic treatment, preferably by means of a local bath, is of great value as a local vascular tonic. For the details of its application, *see* ELECTROTHERAPEUTICS.

4. **Local Measures.**—During a paroxysm the affected parts should be covered with cotton-wool; friction or gentle massage with the aid of a stimulating liniment (e.g., lin. camphoræ) is very useful when it can be tolerated, both during and between attacks. The application of a tourniquet to the affected limb for one or two minutes twice daily has recently been strongly recommended. It seems to act by inducing a temporary loss of vasomotor control (*see Med. Ann.*, 1905, p. 429).

Robert Hutchison.

RECTUM, DISEASES OF. (*See also* PROCTITIS.)

Cancer of the Rectum.—The only treatment which will materially prolong life is excision of the rectum at the earliest possible opportunity. This operation has been greatly improved within recent years, and most satisfactory results can now be obtained, providing the cases are seen early enough. The position of the growth in the rectum does not now affect the question of removal, as any growth can be removed providing it is not too densely adherent to surrounding structures. Growths that cannot even be felt per rectum can be quite successfully removed.

The contra-indications to excision are: (1) The presence of secondary deposits in the liver or abdominal glands; (2) Dense adhesions to important structures, such as the bladder; (3) Fixation of the growth to the pelvic fascia, if high up; (4) Bad general condition of the patient, great obesity, bronchitis, etc.

The best results are obtained from the modern methods of excision of the entire rectum by the perineal or abdomino-perineal routes. In these operations, after excision some part of the sigmoid flexure is brought down and stitched to the skin of the anus after repairing the anal sphincter. Though in some cases it is necessary to leave the patient with a permanent colotomy opening, the possibility of restoring the bowel depends upon the amount of the pelvic colon which has to be removed and the length of the pelvic mesocolon.

The rectum, growth, and glands in the hollow of the sacrum are removed together. It is possible by modern methods of excision to obtain aseptic healing of the wound, and in a few cases almost entirely to restore the normal function of the bowel.

The Results of Excision of the Rectum.—After a successful operation, in which the bowel has been restored, complete functional control is obtained in the normal way and except for some slight difficulty at first in emptying the bowel, the patient suffers but little inconvenience from the removal of the rectum. Stricture will not result providing there is not free suppuration of the wound or sloughing of the bowel after operation. If the sphincters have to be removed, functional control cannot be expected and the patient is more comfortable with a colotomy opening and complete closure of the perineal opening. The percentage of recurrences of the growth after rectal excision is still high as compared, for instance, with the results of operation for cancer of the breast; but better results are to be expected from the present improved methods of operating, and the patient's life is prolonged for two or three years even in those cases in which there is recurrence.

During the last few years great improvement in results as regards immediate mortality has taken place, and the operation has been made comparatively safe. The author's figures for the four years 1915–18 were 65 cases with only 5 deaths. As regards recurrence everything depends on early diagnosis. If the patients are operated on when the growth is at an early stage, and free excision is performed, the prognosis is excellent. Too often the cases have to be operated upon when considerable extension of the growth has already taken place.

Colostomy.—(*See* COLOTOMY, p. 169.)—This is indicated when there is commencing obstruction, or for the relief of diarrhœa and tenesmus. Colostomy, if performed early and before obstruction or secondary septic complications have occurred, will often materially prolong the patient's life; under these circumstances it can usually be reckoned that life will be prolonged by at least six months. It is therefore always well worth considering in inoperable cases.

Curetting.—When the growth cannot be removed, and is low down in the rectum great temporary benefit follows curetting or cauterizing the ulcerated portion of the growth; but growths on the anterior rectal wall should not be curetted, as there is risk of going into the bladder.

Palliative Treatment in Inoperable Cases.—With proper care the patient may be made much more comfortable and saved much pain. Opium should be avoided, if possible, in the early stages, and the pain relieved with acetylsalicylic acid in 10-gr. doses, or with phenacetin, phenazone, etc. Later, opium and belladonna suppositories should be given sufficiently frequently to allay all severe pain, and the dose increased if necessary. If hypodermic injections of morphia may be used. Iron, in the form of tinct. ferri perchlor. by the mouth, is often beneficial in relieving pain and discomfort, and great relief

afforded by irrigation of the rectum with weak antiseptics or astringents. An occasional dose of castor oil, 1 oz., to which 10 minims of tinct. opii have been added, will also be found beneficial in getting rid of fæcal accumulations and preventing congestion of the parts. No form of electrical or *x*-ray treatment is of any value. Radium has been a good deal used in inoperable cases recently, but is not of much value. It seems to delay the progress of the growth for a time, but the author knows of no case in which permanent benefit has resulted. Such treatment more often seriously aggravates the condition and increases the pain. Much better results can be obtained by care in keeping the growth clean and preventing secondary septic infection and ulceration. Anæsthesin ointment introduced through a rectal pipe will often relieve the pain and tenesmus most effectually. Recently very encouraging results have followed the use of colloidal metals in the treatment of inoperable cases of rectal cancer. The most useful of these are colloidal copper and colloidal selenium. They are given by hypodermic injection deep into the buttock, in the case of copper in 5-c.c. doses, and selenium 1-c.c. doses, about once or twice a week. This treatment seems to delay the growth materially, and in a few cases actual retrogression has taken place. It is well worth using, and should be persisted with. No serious results follow the treatment, but it is of doubtful value in cases where extensive secondary deposits are already present.

A guarded prognosis should always be given as regards the prolongation of life in cases of inoperable cancer of the rectum. The author has known several patients who lived in fair health for over five years.

Polypi of the Rectum.—The two common forms of rectal polypi are the myxomatous and fibromatous. The former is the most common, and is often seen in children. Polypi often cause bleeding or prolapse, and should be removed. The sphincter should be stretched under anæsthesia, and the polypi either twisted off, or cut off after ligaturing their base with silk.

Prolapse of the Rectum (Procidentia).—It is important to distinguish between prolapsus recti and prolapsus ani. The latter is a condition commonly associated with piles, and the mucous membrane only is involved, while in the former the whole of the rectal wall comes down, and in the severe degrees of procidentia the peritoneum may form part of the prolapsing mass. Prolapse of the rectum in children is also a very different thing from the same condition in adults. In children prolapse is common and very amenable to treatment, while in adults it is not so common, and treatment is often unsatisfactory.

Prolapsus ani requires no special treatment apart from that necessary for hæmorrhoids (*which see*).

Prolapse of the Rectum in Children.—Treatment should be directed to improving the child's general health, correcting the dietary, regulating the bowels, correcting nasal obstruction, if present, and administering iron and strychnine in small doses to improve the muscular tone. The child must not be allowed to sit on a chamber for the purpose of evacuating the bowel, but should perform this act lying in bed or in a squatting position over a shallow receptacle or newspaper. This is all that is required in most cases, but if not effectual the buttocks should be strapped together with a broad piece of strapping, the front edge of which passes just behind the anus. In a few cases operation is necessary. This usually consists of linear cauterization of the prolapsing bowel, the object being to obtain adhesions between the mucous membrane and the muscular coats of the bowel. From three to five shallow grooves, two to three inches long, are made in the rectal wall with a Paquelin's cautery blade. The child is kept in bed for a week, and made to pass all stools lying down for at least a month.

Treatment in Adults.—Nothing but operative treatment is of the slightest use. The simplest operations are lineal cauterization of the prolapse, as already advised for children, and ligature of the slack mucous membrane in two or three places. A slack fold of the rectal mucosa is seized with forceps, and a silk ligature tied tightly round its base. This is done in two or three places at different levels. It is practically the same operation as that for piles (*see* HÆMORRHOIDS). These operations are not likely to be more than temporarily successful, except in slight cases.

Other operations are: (1) Rectopexy, which is done by making an incision behind the anus and anchoring the bowel into the hollow of the sacrum; (2) Restoring the

pelvic floor by a plastic operation somewhat similar to that for ruptured perineum; (3) Excision of the prolapse; (4) Sigmoidopexy. This consists in dragging up the bowel through an abdominal incision, and fixing it to the anterior abdominal wall.

It is often advisable to combine two of these operations in the same case. The author's operation has given very good results in these cases, and has the advantage of being very simple and involving the minimum of risk, while up to the present there has been no case of recurrence. It consists of making an incision behind the anus, and opening up the posterior pelvi-rectal space with the finger and blunt dissection. This space is then lightly packed with gauze. The gauze packing is removed daily and replaced until the wound has healed from the bottom. This leaves dense adhesions between the posterior rectal wall and the sacrum, and prevents a recurrence of the prolapse. With the exception of the ligature and cautery methods, these operations should not be attempted by anyone not thoroughly accustomed to the performance of difficult surgical operations, as they often involve unexpected difficulties, and the peritoneal cavity may be opened in dealing with the prolapse.

Prolonged rest in the recumbent position is essential after any operation for prolapse.

Stricture of the Rectum (for *Malignant Stricture see* CANCER OF RECTUM, *supra*).—In treating any stricture of the rectum of old standing it must never be forgotten that there is more than likely to be ulceration of the bowel above the stricture. The treatment of fibrous stricture of the rectum will depend very much upon its situation and density, and also upon the degree and extent of ulceration above it. It is therefore very important to make a thorough examination with the sigmoidoscope before proceeding to treat the case. In slight or recent stricture where there is no very dense induration, gradual dilatation with bougies will sometimes effect a cure. The dilatation must be very carefully and gradually performed, and after the stricture has been fully dilated the patient should himself pass the largest bougie which can be inserted, and should continue to do so daily for some months. Unfortunately, in most cases the stricture recurs rapidly in spite of the continuous use of bougies.

Good results have been obtained by posterior proctotomy, by which the stricture and all the tissues are divided straight backwards to the coccyx, the anus being also laid open in the same cut. Of recent years the old operation of internal proctotomy has been revived. It had been discarded because of the often serious complications from sepsis which followed it. Proper antiseptic technique has now rendered it safe, and the results are excellent.

Operation.—The bowel is washed out as well as possible beforehand, and the operation is then performed under full anæsthesia, with a continuous douche of 1½ drachms of lysol to the pint running all the time. The stricture is nicked in three or four places with a blunt-pointed bistoury passed along the finger and through the stricture. Several small cuts are safer than one large one, and they should be lateral and posterior, and not forwards towards the peritoneum. The stricture is then rapidly dilated to the full calibre with Hegar's or the author's dilators. After this the whole area is douched out again, and then the wound swabbed with 1–20 carbolic acid on swabs contained in holders (douching with so strong a solution is not safe). The rectum is then filled with sterilized vaseline, and a large-calibre vulcanite tube is passed through the stricture and fixed in place. The tube should be left in for forty-eight hours, and then dilators passed daily for some time.

At the present day by far the best method of treating a bad stricture is to excise the affected portion of bowel, including the whole of the stricture. The healthy bowel above is then brought down and stitched to the anus: the operation is similar to that of excision of the rectum for cancer. The results of excision are most satisfactory. In cases of stricture at the anal orifice or within two inches of it, such as are sometimes seen after a badly performed operation for piles, the proper treatment is to dissect out all the fibrous tissue and free the rectal mucous membrane. Most excellent results can be thus obtained, but it is essential to success that the wound should heal by primary union and not by granulation. Often the easiest way of removing the fibrous tissue is to excise the last two inches of the mucous membrane, then bringing down the stump.

In bad cases of stricture, accompanied by severe and intractable ulceration, the proper treatment is a left inguinal colotomy, and this should be most strongly urged. Such patients are far more comfortable with a good colotomy, and it is the only way to get the

ulceration to heal. It may be possible later to excise the stricture and close the colotomy, and on the other hand chronic ulceration above a rectal stricture is apt in time to become malignant.

Ulceration of Rectum (*see also* ANUS).—Rest in bed, combined with frequent irrigation of the rectum with some mild astringent lotion, is the best treatment at first. Later, local applications of pure ichthyol, or nitrate of silver 10 gr. to the ounce, may be made by means of a speculum. Good results have followed from the use of zinc ionization (*see* PROCTITIS, CHRONIC). The diet should be as bland as possible, and the bowels should be kept acting loosely. In severe cases, stretching the sphincters so as to obtain free drainage is often necessary; and in very bad cases a colotomy may be needed in order to deflect the fæcal current. *J. P. Lockhart-Mummery.*

RELAPSING FEVER.—In the various forms of this fever the treatment must be mainly directed to the relief of symptoms and complications, of which pneumonia and hyperpyrexia are the most important. These must be treated on ordinary lines. The disease varies greatly in virulence in different parts of the world; of the various clinical forms, the one occurring in Central Africa, and known as tick fever, is the worst.

The disease is most debilitating, and stimulants are usually required towards the end of each pyrexial period, and during the crisis, which is the period of greatest danger. Hot bottles, sinapisms to the cardiac region, and injections of strychnine may be required.

In salvarsan and its derivatives we possess a specific against relapsing fever. It should be given by the intravenous route in doses of 0·3 to 0·9 grm., according to the age of the patient; the exact dosage also depending upon the severity of the case. Of the various compounds, novarsenobillon is the best. Whenever possible the injection should be given early in the pyrexial bout, if possible in the pre-critical period—that is, while the temperature is rising—directly the microscopic diagnosis of the disease has been made. During the apyrexial period the drug has no appreciable effect whatsoever. Generally speaking, one dose is sufficient to prevent any further relapses. *C. W. Daniels.*

RENAL CALCULUS.—(*See* CALCULUS.)

REST CURE.—(*See* NEURASTHENIA.)

RETENTION OF URINE.—(*See* URINE, RETENTION OF.)

RETROPHARYNGEAL ABSCESS.—(*See* PHARYNGITIS.)

RHEUMATISM, ACUTE.

I.—ARTICULAR RHEUMATISM.

The indications for treatment are to:—

1. Alleviate the pain and distress.
2. Control so far as possible the rheumatic processes.
3. Encourage the great natural resistance to the disease.
4. Conduct the patient safely through the stage of convalescence.

The first step towards alleviating the pain and distress is *rest in bed.* This rest must be absolute. The bedstead should be a convenient one in height and breadth for nursing purposes, and should, if possible, consist of a good hair mattress on a modern woven-wire foundation. It is a great boon to the patient to avoid all unnecessary movement, and for this reason it is advisable to have powerful nurses who can manage the heavy lifting. Much importance is generally attached to the necessity of lying between blankets, but in my opinion there is less need for this since the introduction of skilled nursing, and it is most uncomfortable for those with sensitive skins. There are exceedingly soft, light blankets to be obtained which are a great comfort. The nightdress should be loose and made of the best soft flannel. It should be opened down the front for its whole length, and also along the sleeves. A light woollen shawl for the shoulders can be used in addition. By these arrangements it is easy for a nurse to dry the patient gently and rapidly from time to time, and thus prevent his lying in a steamy, sour bath of his own perspiration.

Diet.—During the acute stage this should be fluid and consist chiefly of milk. There is good reason to believe that during the acute illness the function of the kidneys is impaired, and therefore strong meat essences are not advisable. Milk diluted with water or Salutaris water should be given, and 10 gr. of citrate of soda may be added to every half-pint of milk. In addition, a home-made lemonade, to which bicarbonate of potash has been added in the proportion of 20 gr. to the pint, may be placed beside the patient. He should take about three or four pints of the milk and water in the twenty-four hours, and the lemonade between. The citrate of soda renders the milk more digestible, and thirst is relieved by the lemonade. At the present time the condition of 'acidity of the blood' that was supposed to exist in acute rheumatism is not literally accepted, for there is no evidence in its support. Nevertheless, it is a most interesting and remarkable fact that the diplococcus of rheumatism possesses powerful acid-producing properties. The alkaline treatment of acute rheumatism is thus quite as clearly indicated now as in the days of Dr. Fuller. Stimulants are seldom needed for acute articular rheumatism: the indications for their use in rheumatic fever will be given in the section on cardiac rheumatism. While on the question of diet, I would add that in my opinion there is no justification for a rigid rule prohibiting meat. In countries where, of necessity, meat is taken in excess, the disease occurs and is recovered from. In countries where the diet is practically meat-free, it also occurs, and may be fatal. Each case must be judged on its merits. If the type of the attack is sthenic, or the kidneys are affected, meat must not be given except with great caution. On the other hand, the asthenic cardiac type of childhood is often much benefited by a liberal diet.

The Condition of the Bowels.—It may be looked upon as a rule of practice that the bowels should be well opened before a severe course of treatment by the salicylates is commenced. Two grains of calomel in cachet, followed by a saline aperient, will usually answer the purpose. When once the bowels have acted thoroughly, mild aperients, such as liquorice, cascara, confection of senna, or a saline, can be used.

Local Applications.—Numerous local applications to the inflamed joints have been advocated, but in the majority of cases hot wool, skilfully applied, is sufficient. The limbs should be kept at rest, and if necessary all weight taken off them by means of a cradle. There are exceptional cases in which the arthritis is exquisitely painful and unusually obstinate. The limb should then be placed upon a splint, and thus absolute immobility of all the muscles that may act upon the articulation be secured. Fuller's alkaline and opium lotion can also be applied on lint. The formula of this lotion is :—

℞	Potassii Bicarbonatis	ʒss	Glycerini	ʒij
	Tincturæ Opii	ʒj	Aquæ Rosæ	q.s. ad ʒxij

Ft. lotio. To be applied warm.

Blisters are, in my experience, more effectual in the chronic types of painful arthritis. There is another form of application which is believed to produce anodyne effects by withdrawing fluid from the tissues, thus reducing the heat and swelling; examples of this group are antiphlogistine and thermogene. Other forms, more applicable I think to the subacute phases of painful arthritis, are the oil-of-wintergreen preparations. Thus methyl salicylate, a colourless liquid with strong odour, is spread on the skin and covered by some impermeable tissue. Mesotan, a methoxyl-methyl ester of salicylic acid, which has not so strong an odour, is used in solution in olive oil in the proportion of one part of the mesotan to two of olive oil. This mixture is gently rubbed into the affected part, but it should be used cautiously, for troublesome and irritable cutaneous eruptions (erythematous and papular in character) have followed its use. An elegant preparation is a compound gaultheria liniment containing methyl salicylate, gaultheria, and terebene, two or three drachms to be lightly rubbed into the affected parts. Spirosal is another recent preparation of this order.

Medicinal Treatment.—The salicyl compounds are at the present time very extensively used, and yet authorities of mature judgement and wide experience are still at variance as to the best way in which to employ them.

Many physicians believe that these drugs are directly antidotal to acute rheumatism, and some have gone even further, and have looked upon them as tests of the presence of the disease. I think that the whole question of the specific action of these drugs is still an open one. Certain

important facts, however, have been ascertained. In the first place, no drugs ease the pain and lower the temperature in acute articular rheumatism with such constancy as these do. Secondly, none of the other rheumatic manifestations react to these drugs in a manner comparable to the articular lesions. On the other hand, certain points are still in dispute :—

1. Is the lack of success with salicylates in other than the articular lesions the result of insufficient dosage ?

2. Can large doses be given without producing ill effects ?

3. If large doses are given, are the results superior to those obtained by other methods of treatment ?

Dr. D. B. Lees showed conclusively that children and adults can take very large doses of the best preparations of sodium salicylate. His conclusions favour the view that large doses, if they are given *early* in the disease, are antidotes to all rheumatic manifestations. If, however, we consider the possible danger from large doses, we find again there is general agreement that some individuals show an intolerance to these drugs, and in some cases, if large doses are pushed, very grave and even fatal results may ensue. In such cases the vision becomes dim, there are buzzing in the ears, deafness, and giddiness. Sometimes there is headache, and more often vomiting, which is sometimes difficult to control. Of greater importance are the cardiac symptoms : the pulse becomes slow, irregular, and small in volume, and the cardiac sounds are enfeebled. The extremities become cold and clammy, and the aspect of the patient is one of intense depression. In rare cases, a very remarkable series of symptoms arises, in which slow and deep breathing develops, much urine is passed, coma supervenes, and the patient dies in a condition strikingly suggestive of diabetic coma.

Granting this idiosyncrasy, there is dispute as to whether or not in other cases the drugs are depressant. This would seem easy to settle considering the great number of observations that are made ; but the rheumatic poisons are in themselves intensely depressant, especially to the heart. Thus one observer will attribute the symptoms to the disease, and another to the drugs. The last question to be answered is, whether better results are obtained by large doses of salicylates than by other forms of treatment ? Here again, opinions entirely differ ; but in rheumatic cardiac lesions I cannot myself believe that large doses of salicylate of soda produce such good results as do other methods of treatment.

As there is this diversity of opinion, I shall first consider the medicinal treatment with salicylate of soda used only as an aid in subduing rheumatic arthritis and rheumatic pains—the method to which I personally incline—and then the treatment as carried out by those who believe the drug to be a specific antidote (*see* p. 779).

For a strong adult the following prescription may be given :—

℞ Sodii Salicylatis gr. xx | Syrupi Zingiberis ℥ss
Sodii Bicarbonatis gr. xv | Aquæ Chloroformi q.s. ad ℥j

Ft. mist. Two tablespoonfuls every two hours for six doses, every three hours for four doses, and then every four hours.

The result, if favourable, will be a fall in the temperature and marked relief to the articular pains, together with a striking improvement in the general comfort of the patient. In some cases, when the pain is exceptionally severe, it is advisable to add to the evening dose 10 min. of nepenthe, or to give a cachet containing 10 gr. of Dover's powder. If there is much nervousness and anxiety, bromide of potassium is indicated. Here it may be repeated, that the bowels should be well opened at the commencement of the illness. If the patient is easily depressed, sal volatile should be added to the salicylate mixture.

A child of ten years, of robust constitution, can be given 10 gr. of salicylate of soda at a dose ; but frequently, when the drug is being used to control the arthritic pains, 6 gr. will be sufficient. For a delicate child, salicin may be prescribed. This can be given in warm milk thus :—

℞ Salicini gr. x | Sodii Bicarbonatis gr. v

Ft. pulv. Mitte tales xij. Take one in milk as directed.

When the temperature has fallen, and improvement is clearly indicated, the dose of salicylate of soda or salicin is gradually diminished, but these drugs are not entirely discontinued until at least a fortnight has elapsed from the day that the temperature reached normal. In many cases, at the end of this time a change can be made to salicylate of quinine, and a week later to a simple quinine tonic, which for adults can be prescribed in an effervescing alkaline draught.

℞ Saloquininæ Salicylatis (Rheumatin) gr. x

Ft. cachet. Mitte xij. Take one three times a day.

Children will take this drug well if it is given in 5-gr. doses suspended in syrup and water.

Effervescing Quinine Mixture.

℞	Sodii Bicarbonatis	gr. xx	Aquæ Chloroformi	q.s. ad ℥j
		Ft. mist. alkalina.		
℞	Acidi Citrici	gr. xvij	Aquæ Destillatæ	q.s. ad ℥ss
	Quininæ Sulphatis	gr. ij		

Ft. mist. acida. To two tablespoonfuls of the alkaline add one of the acid mixture, and take as a draught three times a day.

For children at this stage of the illness, the following prescription is useful :—

℞	Quininæ Sulphatis		Mucilaginis Tragacanthæ	℥j
	Ammonii Carbonatis	āā gr. ss	Syrupi Aurantii	℥ss
	Potassii Bicarbonatis	gr. v	Aquæ Chloroformi	q.s. ad ℥ij

Ft. mist. Mitte ℥iv. Two teaspoonfuls three times a day after meals.

For the anæmia that may be so marked a result of the acute attack in childhood, collosol iron with or without malt is worth trial, for it seems to be better taken than the usual iron preparations, and not so liable to produce dyspepsia.

The *convalescence* from articular rheumatism, in spite of every care, is frequently retarded by relapses. Many attribute these to an over-hasty return to solid food. I would, however, point out that the diplococcus has prolonged vitality, and we have no evidence that any drugs can destroy it in the tissues, neither can we gauge how completely the resistance of the tissues has done its work. What then is more likely than that there should be these relapses ? There seems little doubt that premature exertion is detrimental, and on this account it is advisable that the tender joints and stiffened ligaments should be skilfully massaged for a week before the patient attempts to bear his weight upon them or make voluntary movements. The massage should include passive movements of the limbs. If the effusion has been more than usually copious, and the softened capsule thereby stretched, it is advisable to strap the joint firmly as soon as the effusion has disappeared. Hydropathy in those cases in which there are left much pain and stiffness, coupled with considerable muscular wasting, is of great service. In this stage there can be no doubt of the value of this treatment. The combination of radiant-heat baths and massage is also very useful. Stimulating liniments, such as the compound mustard or camphor liniment, are also helpful, and a prescription on the following lines will sometimes give relief :

℞	Liquoris Arsenicalis	℥iij	Syrupi Zingiberis	℥ss
	Potassii Iodidi	gr. v	Aquæ Chloroformi	q.s. ad ℥ss
	Sodii Salicylatis	gr. x		

Ft. mist. Mitte ℥vj. One tablespoonful, in an equal quantity of water, three times a day after meals.

Should there be, in addition to pain, swelling of the joints after movement, blisters should be applied above them. Occasionally cases are met with, resembling those of acute articular rheumatism, *which do not respond at all to treatment with salicylate of sodium*. These some authorities consider to be examples of a special disease they term acute rheumatoid arthritis. I am not convinced of the truth of this opinion in all instances. In such cases it may be advisable to push the drug for a few days, but if there is no improvement, then to abandon this method and turn to the alkaline quinine mixture ; or, if the pain is severe, to the acid solution of quinine, to which liquor morphinæ hydrochloratis can be added. Another difficulty which sometimes confronts us is finding that most of the joints react to treatment with salicylate of sodium, but that one remains obstinate, very painful, and drifts into a condition of arthritis deformans. We must be on our guard for such an occurrence when there is great œdema and peri-articular swelling. The limb should be placed on a splint, and, if (though this is exceptional) there is much intra-articular fluid, it is advisable to aspirate the joint very slowly and with strict antiseptic precautions. A film of the exudation should be examined, and if the diplococcus is present in numbers, the joint cavity should be washed out with a 1 per cent carbolic solution. In any case, after aspiration the joint should be carefully strapped with Scott's dressing, or Bier's method of passive congestion be tried. I do not think that the free opening and drainage of the joints in acute rheumatic arthritis is indicated in the present state of our knowledge.

In recent years *collosol preparations* have attracted much attention, particularly for the treatment of rheumatic cases which show a tendency to drift into a subacute or chronic arthritis and fibrositis. Two preparations which have been standardized in the Crookes laboratories are collosol sulphur and collosol iodine. *Collosol sulphur* may be given orally in teaspoonful doses in half a wineglass of water; this dose may be gradually increased to a tablespoonful. It is also used as an intramuscular injection, for which ampoules containing 1 to 2 c.c. are dispensed. *Collosol iodine* may be given orally in doses of 1 to 3 drachms; intramuscularly 5 to 10 per cent; or intravenously 10 to 200 c.c. It has also been used as an external application in the form of a 3 per cent iodine oil.

I have made no allusion to the treatment of acute dilatation of the heart, for the necessary rest in bed and proper care during convalescence will generally put this right. After an attack of rheumatic fever, the winter and spring are better spent out of England. Thus, a winter in Egypt may complete the recovery. As regards our own climate, we badly need a careful investigation and report upon the incidence of acute rheumatism in all its ordinary types in various localities. In general terms, a dry gravel soil and liberal amount of sun are advisable, and inland is preferable to seaside.

Bee-stings in Rheumatism.—I feel I ought to devote a few lines to the treatment of rheumatism by bee-stings, because I am partly responsible for its recent development. So far as I understand, it rests upon two somewhat slender supports. The first is an empirical one, viz., the observation that bee-keepers, who undoubtedly become to a great degree immune to bee-stings, are accredited with freedom from rheumatism. The second is more scientific. Triboulet, Paine, and I pointed out that the diplococcus was strongly acid-producing in culture, and Triboulet discovered this acidity was in part due to the formation of formic acid. Ainley Walker and Ryffel further showed the presence of a considerable quantity of this acid both in culture and in the micrococci themselves. As the sting of a bee is greatly dependent upon the presence of formic acid, it does not require a great stretch of imagination to picture the painful results of rheumatism as largely due to this acid. If then the hardened bee-keeper becomes immune to bee-stings, which I believe is certainly the rule, and if, as there is some medical and lay evidence to show, such people are also thereby protected against rheumatism, why not sting the rheumatic with bee-stings? This method has been chiefly applied in stubborn rheumatic arthritis, and a special apparatus has been devised by Burton for holding the bees. Some good results have been recorded, and it is a method which attracts the layman's imagination. We must not forget, however, that the micrococcus forms various acids in different media, and as yet we have no reliable data upon the occurrence of formic acid in the human tissues in rheumatism. We need, too, many more facts about the immunity of bee-keepers to rheumatism. In acute rheumatism I suspect we should need a good swarm of bees, and as regards the local forms of this disease, I believe we may safely trust that those who undergo this treatment will eventually give a decided opinion.

II.—CARDIAC RHEUMATISM.

This is most frequent in childhood, and on this account the outlines of treatment are mapped out for the child, but can be modified for the adult.

The chief therapeutic indications are:—

1. To relieve pain and distress by immediate and complete rest, coupled with suitable remedies.
2. To feed the patient skilfully.
3. To spare the heart all avoidable strain, and to endeavour to strengthen it.
4. To guide the patient through the convalescence.

The child should be kept in bed, and trained nurses are advisable, for much depends upon the nursing in difficult cases. For easing the pain and distress there is no better remedy than the *ice-bag*, which has been so warmly advocated by Dr. D. B. Lees. The details of this treatment are as follows:—

The precordial area is marked out with an aniline pencil as a guide to the nurse. If possible, two ice-bags should be in use, so that one can be substituted at once when the other is exhausted, and hot-water bottles should be placed in the bed to keep the lower extremities warm. The bag must not press heavily upon the chest, and if there is much precordial pain it should be suspended from a cradle. For fixation in position on the chest—a point of much importance—a domette

vest should be made with armholes, and, in addition, with a third hole over the cardiac region through which the neck of the ice-bag is slipped. The vest is fixed above by a tape passing round the neck, below by a safety-pin. The ice should be carefully pounded, and the top of the bag must be screwed down on the washer. Nothing should intervene between the bag and the skin, although cotton-wool should be packed round the bag to absorb the moisture which tends to condense upon its surface. The most convenient arrangement is to refill the bag every two hours, at which time the temperature and the rate of the pulse should be taken. The continuous application is the most satisfactory, although in the early morning hours it may be advisable to intermit the treatment.

If skilled nursing cannot be obtained, the ice-bag may still be used during the day. Some delicate children find the cold too depressing, and in spite of stimulants may show signs of collapse. In such cases, the application of belladonna liniment or warmed pine wool is preferable. Antiphlogistine is also a useful application. When there is considerable distress consequent upon dilatation of the right side of the heart, four leeches applied to the precordial region give relief, but I do not personally favour the use of leeches as a routine method. It is for the dilatation of the heart rather than for the pain that they are indicated. In these cases, if there is arthritis or much muscular pain, let 5 gr. of salicylate of sodium be given to a *child of seven* with the object of controlling these pains. For the precordial distress and sleeplessness, opium may be given, the bowels having been previously opened by aperients.

For Insomnia and Restlessness.

℞ Nepenthe ℥iv | Glycerini ℥xx
Potassii Bromidi gr. v | Aquæ Chloroformi q.s. ad ℨss
Misce. Mitte ℨvj. Two teaspoonfuls to be given at night or every six hours for a child of seven.

I do not advocate the free use of salicylate of sodium, although the details of this method will be given later for the guidance of those who favour the theory of its specific action.

In many cases there is no special necessity for relieving pain, and then a prescription containing small doses of quinine is serviceable; children dislike it less in simple than effervescing solution. Regarding stimulants, alcohol, in the form of sound brandy, is useful when the temperature is low, the pulse feeble, the appetite poor, and the rest disturbed. It is not advisable for routine use in rheumatic heart disease, and quite wrong to persist with it longer than is absolutely necessary. The same discretion is needed in the employment of direct cardiac stimulants. There is nothing to be gained by plying an excited heart with strychnine during the early stage of acute pericarditis, for the rapidity of the heart is thereby increased, and its force may be exhausted prematurely. Should the cardiac excitement be the prominent feature, and there be no unusual effusion, digitalis is more useful.

℞ Tincturæ Digitalis ℥v | Glycerini ℥xv
Potassii Bromidi gr. v | Aquæ Chloroformi q.s. ad ℨss
Ft. mist. Mitte ℨiv. Two teaspoonfuls every six hours for a child of seven.

It is when the strength of the heart is failing that strychnine is of great use. It can at first be given by the mouth in combination with digitalis, and later hypodermically, in doses of 2 min. every six hours to a child of seven. When the heart, after the outbreak of pericarditis has died down, is left feeble and dilated, I have observed good effects from the use of formate of soda.

℞ Sodii Formatis gr. v | Aquæ Chloroformi q.s. ad ℨss
Syrupi Aurantii ℨss
Ft. mist. Mitte ℨviij. A tablespoonful every six hours for a child of nine.

It is a very grave event when, in an attack of acute pericarditis, vomiting, restlessness, and livid pallor supervene. It is all important to cope with the sickness at once. Such drugs as digitalis and strophanthus should be discarded, and recourse had to hypodermic injections of strychnine. The drugs given by the mouth should be those which assist in arresting the vomiting. The milk should be peptonized, or citrate of sodium added in the proportion of 2 gr. to the ounce of milk, or ass's milk obtained. Patent meat-juice is sometimes of great value, and well-made beef, chicken, or veal tea may be used

in place of milk. A stomachic mixture containing bismuth and soda with 3 min. of dilute hydrocyanic acid will help to arrest the sickness. If in spite of these measures the vomiting is persistent and urgent, all food by the mouth should be stopped and recourse had to rectal injections. For the lividity, oxygen is of some value, and for the restlessness, the bromide and opium mixture already mentioned. Brandy and dry champagne are the most useful stimulants. Allusion has been made to the early application of leeches in pericarditis. It is, however, in the later stages, especially in cases when there has been old valvular disease, that their use will be most frequently required. When the right heart is beating forcibly in the epigastrium, when the pulse at the wrist is small and feeble, the colour ashen, and the child in great distress, five leeches applied over the liver may give great relief, and even if this be only temporary, it is some gain. The leeching should be followed up by free stimulation of the heart. Should the rare event occur of embarrassment of the heart from a large pericardial effusion, it will be found that the impulse becomes diffuse and wavy, the cardiac sounds more and more muffled, and the precordial dullness wooden in character. If then, after most careful deliberation, it is thought advisable, paracentesis should be done by introducing the needle of the syringe at the extreme limit of the cardiac dullness in the left axilla over the region of the apex. The operator must be prepared to find that flakes of lymph may block the syringe, and on this account deliberate incision of the pericardium by a skilled surgeon is preferable.

The convalescence after an acute carditis is prolonged. Six months of the greatest care is not a day too much. This time should not, however, be spent in passive rest, but be employed in cautiously preparing the heart for the return to everyday life. The methods at our disposal are —

1. Rest, fresh air, and sun.
2. Massage of the limbs.
3. Passive and resisted movements.

There can be little doubt that it is a mistake to keep children at rest for long periods and then allow them to plunge suddenly into ordinary life. When once the temperature and pulse are steady, and have remained so for an interval of three weeks, massage of the limbs should be commenced.

I know no condition in which more satisfaction may be obtained from a prolonged convalescence than a severe carditis in childhood. We cannot at present control the lesions to any great extent, but may add many years of peace and happiness by this caution. Here, as elsewhere, I would beg for the founding of special convalescent homes for the poorer children who have fallen victims.

Cod-liver oil and malt is a remedy of value in the convalescent stage, particularly during the winter months. Among the poor, the anæmic, delicate children, damaged by previous rheumatism, frequently derive great benefit from this old-fashioned prescription.

III.—ACUTE RHEUMATISM WITH HYPERPYREXIA (CEREBRAL RHEUMATISM.)

This most dangerous condition is probably the result of an acute rheumatic toxæmia, for local lesions are the exception, and recent observers have found great and general degeneration of the nerve-cells in the brain. It is fortunately rare, although it may supervene in what is apparently a mild attack of rheumatism, and not only in the severe forms. The onset is as a rule in the third and fourth week of the active disease. Warning symptoms are headache, delirium, and vomiting. Importance has been attached to the sudden disappearance of the arthritic pains without any corresponding improvement in the general condition of the patient. In other cases, cutaneous hyperæsthesia has been noted. Graver signs are spasmodic twitchings, irregular breathing, and a lapse into semi-consciousness. The temperature may rise with great rapidity to the height of 107°, 108°, or even 110° F. It must, however, be remembered that grave nervous symptoms may arise with a temperature of about 105°, and that such symptoms must be looked upon as pointing to cerebral rheumatism, unless there should be evidence of severe pericarditis.

The most successful method of treatment is the use of the cold bath. Some advise that the bath be at first warm (about 90° F.), then rapidly cooled down by ice; others, that it be only tepid (75°), and the ice added. I think that those who advocate the

latter and more drastic treatment are more likely to be successful, for, as they point out, the element of nervous shock is in itself of some value. There is undoubted danger of collapse; but with the slower method the patient must remain longer in the bath. In either case no time should be lost. Collapse can only be anticipated by watchfulness and the use of stimulants. The temperature is taken repeatedly while the patient is in the bath, and it is important to remember that the fall in the temperature will continue after the patient has been removed. Thus, if the initial temperature is 106°, the patient should be taken out when it has fallen to 102°. Twenty minutes is the average time required.

It must sometimes happen that there is no convenience for giving a bath. In such cases a sheet can be wrung out in cold water and wrapped round the patient, who is then rubbed over with smooth blocks of ice. This again is a great shock, and the utmost watchfulness is requisite.

Should the temperature rise again, the bath must be repeated. No drugs appear to control the fever. Salicylate of sodium is powerless, although when once the temperature has been lowered, both salicylates and quinine may aid in keeping it down. Drugs of the nature of phenazone or phenacetin are ineffectual alone, and too depressant if combined with the cold-bath treatment. The physician must be prepared to find that all efforts are useless; for the cold bath, though the best remedy at present known, is far from infallible.

IV.—OTHER RHEUMATIC MANIFESTATIONS.

The greater number of rheumatic symptoms not dealt with already in this article are treated upon general principles. There are, however, a few points in connection with them that are worthy of mention.

Rheumatic Pleurisy is essentially plastic in type, and seldom gives rise to much effusion. Should it, however, complicate cardiac dilatation and tricuspid regurgitation, then fluid may accumulate rapidly and increase the dyspnœa. In such cases the fluid should be drawn off before there is any great accumulation, particularly should it occur on the right side, embarrassing the right chambers of the heart. In one case I was compelled to tap the chest on account of an extensive active effusion, but this is quite exceptional.

Unusually high pyrexia in acute rheumatism, apart from the cerebral type, should suggest a patch of **Pneumonia.** This usually subsides rapidly, with no special treatment. The type of rheumatic pneumonia is bronchopneumonic.

Acute Pulmonary Œdema—a rare occurrence—commences, as in renal disease, with the appearance of numerous fine râles in the upper lobes of the lungs. There is also a rapidly-increasing dyspnœa. All depressing remedies should at once be stopped, and such cardiac stimulants as strychnine and strophanthus employed, combined with atropine.

Alimentary Disorders.—The possibility that the rheumatic infection may attack the abdominal viscera seems worthy of more attention than is perhaps given to it. We find, not infrequently, that children complain of abdominal pains at the commencement of and during an attack of acute rheumatism. Sometimes it would seem that the pain is muscular in origin, while in other cases it is clearly due to intestinal disturbances, as shown by vomiting or the passing of much mucus. In adults, acute dilatation of the stomach may occur, and sometimes severe pain in the region of the colon, while in children mucous colitis is not infrequent. These attacks of colitis may replace, or occur simultaneously with, a rheumatic attack.

The question of a rheumatic appendicitis has reached a new stage since, with Dr. Paine, I have been able to show that the diplococcus intravenously injected may cause an appendicitis in rabbits indistinguishable in its morbid anatomy from that of some cases of human appendicitis. It is significant also that in a child suffering from appendicitis and tonsillitis, a strepto-diplococcus isolated from both lesions reproduced in rabbits appendicitis, arthritis, and carditis.

The chief indications as to treatment that result from these investigations are the particular care of tonsillar affections in the rheumatic, the realization that appendicitis may result from a blood infection, and the need for careful attention to the

alimentary canal. Another point worth attention is the occurrence in the rheumatic of attacks of nausea with a coated tongue, offensive breath, and pale motions. Here again, it is interesting to find that the diplococcus can be isolated from the bile of infected rabbits, and that a gall-stone has been found by us in the gall-bladder after a protracted infection. These results may throw light on the difficulty there may be in giving strong iron preparations to the rheumatic, and may explain in part the remarkable intolerance to salicylate of soda that sometimes occurs in children and adults.

Renal Disease.—I am of opinion, with others, that rheumatic renal disease is not uncommon. The treatment is conducted on general principles, and the subject is mentioned here as a warning of the tendency in the rheumatic to develop this serious condition.

Erythema Nodosum is looked upon by many as a special disease. Rest in bed and soothing lotions are indicated for the painful swellings. These are most commonly met with over the shins, but may also occur on the upper extremities and trunk. Salicylate of sodium relieves the articular pains, but does not appear to control the course of the disease. Gargles should be freely used for the sore throat which is not infrequently present.

Rheumatic Tonsillitis shows no very special clinical features. In most instances there is a general and diffuse redness, spreading over the tonsils and uvula. On the other hand, it may be more severe, and I think that some cases of rheumatic tonsillitis are mistaken for diphtheria. The sore throat is frequently very transitory, but hardly sufficient attention has been directed to this manifestation. Children who are rheumatic, or inherit the tendency, should be taught to gargle early in life, and much attention should be paid to their throats. They can safely use a gargle of oxymel, borax, and water. Adults can use a gargle containing salicylate of sodium, or formalin, or chlorate of potassium. Some rheumatic children have large diseased tonsils, with deep pockets of unhealthy exudation. At the present time I am following the suggestion of my colleague, Mr. Waugh, and advise such tonsils to be *enucleated* in the quiescent period between rheumatic attacks. Dr. Paine and I have shown that cultures obtained from the depth of these tonsils enucleated in the quiescent stage contain strepto-diplococci which will produce experimentally both arthritis and carditis. I am now in the position to make some definite statements of practical use upon this question of operations on the throats of the rheumatic.

1. Operations in the acute phase may precipitate an acute attack of rheumatism.
2. In the quiescent stage there is no such danger, and if the tonsils are large and unhealthy there will be marked improvement in the general health.
3. Attacks of rheumatism may occur again, however, although the tonsils have been enucleated.

V.—OTHER METHODS OF TREATMENT.

Treatment by Sodium Salicylate used as a Specific.—In the description of this method, I cannot do better than follow the rules laid down by Dr. D. B. Lees in his monograph upon *The Treatment of some Acute Visceral Inflammations*, for there can be no doubt that if the drug is specific, the logical procedure must be to push it in the more severe types of the disease. For an adult, 20 gr. of salicylate of sodium are given, combined with 40 gr. of sodium bicarbonate, every two hours during the day and every four during the night. Dr. Lees emphasizes the necessity for the addition of a quantity of bicarbonate of sodium double that of the salicylate, for this combination tends to prevent the supervention of that dangerous form of dyspnœa already described. In proportion, children require large doses. Thus, a child from six to ten years will commence with 10 gr. of the salicylate and 20 gr. of the bicarbonate every two hours in the day and every four hours at night. In two days' time the doses are raised to 15 and 30 gr. respectively, and later, even to 20 and 40 gr. This treatment is persisted with until the symptoms of the acute disease are overcome, and then the doses are cautiously diminished. For rheumatic chorea the same line is adopted. The objections to the method by those who do not agree with it have already been enumerated.

Surgical Treatment of Rheumatic Arthritis.—O'Connor and others have advocated the free opening of the joints in severe cases of acute articular rheumatism, on the

principle that the process is an infective one, and that the heart may be infected from the local lesions. Vernon Shaw has, in fact, experimentally proved that the *Diplococcus rheumaticus*, when injected into the knee-joint of a rabbit, will cause not only arthritis but endocarditis. Granted that these reasons, so far as they go, are sound, I cannot believe that in the majority of cases there is any necessity for such drastic measures. Moreover, as the diplococci are located especially in the synovial membranes, and not in the articular fluid, this treatment, though drastic, is not radical; further, it cannot prevent a primary infection of the heart, which clinical experience leads one to believe is a frequent event.

Serum Treatment.—It is in some such direction as this that we look for help in the future, though we do so with feelings chastened by a remembrance of repeated failures in serum therapy. The difficulties are numerous. The diplococcus, though tenacious of life, soon loses its virulence, and the virulence is not as a rule very high. An antibacterial serum is notoriously uncertain in its action, and such sera cannot as yet be standardized. At the present time no specific serum has established itself, and should one appear, let us hope that it will fall into the hands of those who realize how great a natural tendency there is to recovery in acute rheumatism. Those who do not believe the micro-organism is specific have employed sera made from several varieties of the streptococcus. This method I have myself used without success, but the polyvalent sera are apparently improving in efficacy, and their value is still *sub judice*.

For six years I attempted in carefully chosen cases to use a serum made from the diplococcus, but I can report no really satisfactory results.

Vaccine Treatment.—This is a method which would seem to promise much, particularly in the obstinate relapsing cases of rheumatism in childhood. Unfortunately we are almost invariably driven to use a 'stock vaccine', for it is difficult to isolate the micrococcus except from cases of severe pericarditis. I feel strongly that this fact opens up several contingencies. It may be thought, for example, advisable to withdraw fluid from the joints, or even from the pericardium, with a view to obtaining an 'auto-vaccine'. Upon this method I would accordingly venture to express myself very clearly. It must be remembered that the micrococci lie primarily in the tissues and not in the fluids, and as I have always maintained, and Professor Beattie has recently supported, there is no apparent relation between the number of the micrococci and the severity of the reaction. I am convinced, then, that there will be many failures to isolate the micrococcus, and all evidence with regard to arthritis has pointed to this conclusion. Accordingly, in the present state of our knowledge, we take a considerable responsibility in attempting to obtain a vaccine by such undertakings. With increasing knowledge of the streptococci utilization of the throat seems a more hopeful line, but at present the difficulty here lies in the fact that we rely upon experimental data to assist us in the differentiation of the micrococcus, and when it has been passed through animals it may be altered in character and the original culture, pending experimental results, may lose potency. Working with a stock vaccine made for me by Messrs. Burroughs and Wellcome, I have not convinced myself of its value, but much more work and time will be needed before reliable reports can be expected. I have had no evil results. At the present time, in the acute rheumatism of childhood, I am trying a vaccine from a strain isolated from the rheumatic nodule.

Phylacogen Treatment.—Among the more recent developments in treatment has been the rheumatic phylacogen of Schafer, which has been widely used for rheumatism in general in the United States, and more recently in this country. Phylacogens are described as sterile aqueous solutions of metabolic derivatives generated by bacteria when grown in artificial media, and are neither 'vaccines' nor 'sera'. The rheumatic phylacogen consists of equal parts of a filtrate obtained from the rheumatic micrococcus and a mixed-infection phylacogen. I am not prepared to agree with Schafer's statement that all infections are essentially mixed infections, for this has not been the experience of Dr. Paine and myself with regard to rheumatism. Numerous cases have been recorded more or less completely, in which wonderful results have been obtained with this treatment. The phylacogen has been given subcutaneously and intravenously, but of the latter I have no personal experience. No one should use this method of treatment without being acquainted with the systemic reactions, which are recognized to be of frequent occurrence. When they are marked they are startling, and we may well ask ourselves whether the subsequent results justify their occurrence, and whether they are to be

explained as a phase in the curative process, or as a gallant effort by Nature to overcome a fresh poison imposed upon it in addition to the sufficiently grave rheumatic ones. In a severe case there is a rigor which may last an hour, a swift uprise of the temperature, profuse sweating, a rapid heart, headache, and general malaise. The strongest supporters of this treatment advise that the first dose should be given subcutaneously. This is generally stated as ranging from 2 c.c. to 10 c.c., the quantity being gradually increased from the initial one. If it is well borne it may be administered daily, but if there is some reaction a delay for forty-eight hours is advisable. The intravenous dosage ranges from 0·5 c.c. to 5 c.c. Six successive doses may be given, and many more have been administered in the chronic forms of rheumatism. After experience, I have found in childhood an initial dose of 5 min. advisable, gradually increasing at each injection (1 c.c. is equivalent to 16·9 min.). In this way severe reactions are avoided. If it is held that without reactions of severity the treatment loses its value, I advise against its use at this age. In the lingering cases, it has seemed to be helpful in lowering temperature, and possibly in shortening the duration of chorea.

The results in rheumatoid arthritis are beyond the scope of this article.

Radium Treatment.—Treatment by water impregnated with radium emanations has been advocated, particularly in chronic arthritic affections. It is too early as yet to state whether this is of any value in the acute forms of rheumatism; the method seems purely empirical, and the effect accordingly to be judged only by prolonged and careful clinical observation. This can be stated, that no startling result has been observed up to the present.

F. J. Poynton.

RHEUMATISM, CHRONIC (FIBROSITIS).

The essential pathological changes in chronic rheumatism take place in the white fibrous tissue of muscle-sheaths, tendons, aponeuroses, ligaments, periosteum, fascia, and nerve-sheaths. The lesion consists in inflammatory overgrowth of the connective tissue, this being the result of a local reaction against microbes or possibly toxins, conveyed by way of the blood-vessels. The irritant gives rise to proliferation of fibrous tissue locally, with serous exudation, and the whole may resolve without treatment, or may become fibrous and permanent. When once formed, these fibrous indurations are usually more or less defined and circumscribed, and, as felt through the skin, they vary in size from a split pea to an almond, or they may be in comparatively large masses, or spread out as an inelastic layer under the skin. They may occur after acute rheumatism, rheumatic colds, influenza, gonorrhœa, rheumatoid arthritis, and local injuries such as a sprain, and from mucous colitis. They are therefore sequelæ of many morbid conditions. Many have nerve-twigs passing through them, the fibrous-tissue sheaths of which are in a condition of interstitial neuritis which renders them very tender to pressure. In an individual with these lesions, exposure to cold and wet, muscular exertion, a chill, indigestion, and other exciting causes produce swelling of the fibrous tissue, with consequent pressure on nerves, and this gives rise to the series of symptoms which are characteristic of 'chronic rheumatism', namely, stiffness, aching, pain, a feeling of fatigue, and often neuralgia. These fibrous indurations may occur in any part, but they are most frequently found in the back, thighs, legs, neck, shoulders, and around the joints. According to the part specially affected, we use the terms lumbago, stiff neck, pleurodynia, sciatica, etc. The subcutaneous fibrous tissue is very often the seat of similar lesions, and fat tends to be deposited in larger or smaller masses around them ('panniculitis', 'chronic subcutaneous fibrosis'). The swellings can be most readily made out by smearing the skin with oil or vaseline, and then passing the thumb or tips of the fingers over the part with firm, gentle pressure. They are usually tender on pressure, and can be felt as ill-defined, doughy swellings. The larger ones, and those in the panniculus adiposus, can be readily grasped by the fingers.

Treatment.—When the indurations are quite recent, they can be resolved comparatively quickly by massage; hence, after an attack of acute rheumatism or influenza any painful local spots should be efficiently massaged for ten days or a fortnight. A course of treatment at a spa, with hot baths and rubbing, is a great aid to complete recovery. During an acute exacerbation occurring in a chronic case, when the fibrous indurations swell and cause pain or severe aching, general treatment may be necessary. The treatment is that of a slight feverish attack, and improvement takes place in a few days. Sodium salicylate, acetylsalicylic acid, or salicin, alone or with phenacetin, greatly relieves the pain; or a hot bath followed by a copious perspiration, or a Turkish bath, may cut short the attack. If the pains are widely spread, rest in bed, light diet, saline purgation, and mild diaphoretics and diuretics hasten recovery, and give ease to the patient.

Very often the chief site of the pain is localized in the lumbar region, or in the

shoulder, neck, or chest wall. If so, a few thorough applications of massage may giv complete relief. The parts are usually very tender, and the manipulations must be begu very gently by stroking, so as to get rid of the exudation and relieve tension, but graduall more severe pressure can be borne, until finally the fist or knuckles may be forcibl applied. Dry cupping, hot applications, mustard, methyl salicylate, menthol, A.B.C liniment, etc., are all of great value in relieving the local pain, and may be used in additio to the massage. Any chronic infective focus in the body should be treated as energetically as possible.

To obtain permanent cure and complete relief from recurrent attacks, the fibrou indurations must be got rid of, and this is always a tedious and troublesome affair.

Massage.—The most important agent at our command to accomplish this is massag aided by appropriate exercises. General massage as ordinarily applied is of no use, a treatment must be specially directed to the nodules and indurations which can be felt and to those parts which are painful on pressure or movement. In carrying out th massage, the muscles of the part should be relaxed, and the skin (shaved if necessary) b well smeared with vaseline, oil, lard, or liquid paraffin. To begin with, the rubbing shoul not be too severe, as it is apt to irritate unduly the indurations and so cause sharp pain followed by aching and stiffness. It requires a good deal of tact and experience t determine how much pain must necessarily be caused, and how much the patient ma reasonably be expected to put up with. Different individuals vary very much in thes respects, and also in the feeling of fatigue following the massage. If the manipulation are properly carried out, the pain is severe only during the actual rubbing. After a fe days of treatment the fibrous thickenings become harder and more defined, and only the are many of them detected. After treatment for ten to fourteen days they begin t shrink in size and become more callous, and then more and more pressure may be applie to them, until even the knuckles may be used. The massage must be carried out dail for an hour, about fifteen minutes being devoted to each part treated. If expense is n object, two masseurs may be employed. If the indurations are numerous and widespread over the body, the best plan is to select three or four of the worst regions for treatmen (e.g., the back and thighs), and to continue with them until a cure is effected, before pro ceeding to deal with other parts. At the beginning of each treatment gentle effleurag should be given for two or three minutes to remove serous engorgement and to mak the subsequent manipulations less painful. For a thoroughly satisfactory result th indurations must be completely dispersed, otherwise the pain and aching recur. Th length of time required for this varies very much. Recent soft thickenings can be remove in two or three weeks, or less. In old-standing cases, three to six or twelve months ar required. The rapidity of dispersion depends greatly upon their anatomical situatio If the nodules can be compressed against a bony part, such as the sacrum or humerus, th massage is much more effective than when they lie in the fleshy mass of the thigh or alon side the spinal column, where they are difficult to get at. Deeply-placed nodules in th heel and elsewhere can seldom be satisfactorily treated.

Exercises.—Appropriate exercises which stretch the joints, aponeuroses, and muscl involved, are a great aid to the treatment just described. They can be readily devise and can be carried out without any apparatus, or with the aid of dumb-bells, Indian club a stick, and an indiarubber exerciser. Two periods of ten minutes daily are sufficien for the purpose.

Faradism.—The faradic current is of some assistance also, especially if neuritis present.

Drugs.—No remedies are known which cause absorption of the fibrous induration Locally, blisters and iodine sometimes do good, but very often they have no effec probably because many of the indurations are beyond the reach of their action. Whe the periosteum or joints are affected superficially (close to the skin), the results are bett than in other cases.

Where intestinal indigestion is present, a small dose of rhubarb and grey powder night, with a saline purgative in the morning, often lessens the aching. The salicylat of sodium, of methyl, and of quinine, and other salicyl compounds, such as acetylsalicyl acid, salicin, salol, etc., often give relief to pain, but their value is merely that of temporary palliative. The same is true of phenacetin, phenazone, quinine, and simil

substances. In very recent cases potassium iodide has a limited value, but it is quite incapable of dispersing old indurations.

Diet.—Dietetic treatment is, *per se*, of no specific value. The broad rule is to avoid gastro-intestinal fermentation, and this is best done by a sufficient but simple ordinary diet. It is very important that digestion should be perfect.

Spa Treatment.—In recent cases, where the fibrous thickenings are newly formed and still plastic, cure is often rapidly brought about by a course of bathing, or hot-air treatment, combined with massage. Even in chronic cases a good deal of relief from the stiffness and aching is obtained. The indurations remain, however, and, after a longer or shorter time, again give rise to symptoms.

Climate.—During a sojourn in a dry, stimulating climate, rheumatic people find that their sufferings are much lessened or even entirely abolished. In some cases the indurations appear to be absorbed.

Surgical Treatment.—Single nodules, if they are well defined, may be excised. The operation is not always an easy one, as the small mass of fibrous tissue may lie deep, and is then very difficult to find.

Chromic Acid.—If the nodule is sharply defined and can be accurately penetrated by a hypodermic needle, the injection of 5 to 8 min. of a 1 per cent solution of chromic acid often causes it to shrink, and greatly relieves muscle and nerve pain. The small piece of fibrous tissue is, however, very easily missed, and the treatment is only occasionally suitable.

Prophylaxis.—Rheumatic patients should avoid damp, draughts, and over-exertion; but on the other hand they should lead active out-of-door lives as far as is possible, and take plenty of muscular exercise. Sore throats, muscular colds, and indigestion should always be carefully and immediately treated.

Prognosis.—Under such methods of treatment as have been indicated, the prognosis is good in most cases of ordinary severity, but time and perseverance are necessary. In very severe cases, where there are large and numerous indurations, and the patient is very stiff and crippled, a complete recovery is hopeless, but by stretching, massage, and manipulations, more freedom of movement may be obtained. When the subcutaneous tissue is brawny and much thickened over a large area, such as the lumbar region, any very substantial improvement is rare except after very prolonged and continuous treatment. (*See also* Electrotherapeutics, Gout, Hydrotherapy, Lumbago, Photo-therapy.)

Ralph Stockman.

RHEUMATOID ARTHRITIS.—The treatment of rheumatoid arthritis must be begun at the earliest possible moment if satisfactory results are to be obtained. When this disease is recognized in its early stages and a carefully thought-out plan adopted, the results of modern treatment are wonderfully encouraging.

Rheumatoid arthritis is essentially dependent on agencies which lower the general health, and any line of treatment not based upon this fact is foredoomed to failure. Recently, too, it has been admitted that the actual cause of the disease is, in all probability, a bacterial or toxic poison affecting the entire system as well as the joint structures. It is therefore essential to make a most careful scrutiny of the patient's past history, to discover the offending organ or function through which the poison has obtained entrance, and, by correcting any local disturbance, prevent further development of the mischief. For instance, it is important to remember that in many cases the disease follows some chronic lesion of the mucous membranes, some local discharge, such as pyorrhœa alveolaris, some intestinal, ovarian, or uterine disorder, or it may come on subsequent to some general infection, such as influenza, etc. Local lesions must, in the first instance, be remedied as far as possible; in the second place, vaccines can in some cases be profitably employed, and in all it is possible to increase the resisting power of the patient by overcoming general debility; and in the third place, the organism must be assisted by drugs, baths, etc., to eliminate the poison.

With these objects in view the principal elements of treatment may be subdivided into four sections: (1) Diet, clothing, exercise, climate, etc.; (2) Vaccines; (3) Drugs; and (4) Thermal, electric, and surgical treatment.

I.—DIET, CLOTHING, EXERCISE, AND CLIMATE.

1. *Diet.*—Following what has already been said, the diet must be of a nourishing and sustaining character, but it must not be too rich. It is fatal to place a patient on a low diet on the supposition that it is a gouty condition; any restricted dietary is almost certain to do harm. It should be varied, and contain plenty of nitrogenous food. Fats are important, and cod-liver oil in many cases must form a staple article of diet. Vegetables and fruit are necessary; abundance of milk, butter, and cream are indicated. Should there be fever, the food must be given in a liquid form. Stimulants are often of service, especially good sound wine; but each case must be considered separately, and should the stimulant increase the pains, it must be discontinued. Food should be taken regularly, and its quantity determined by the patient's condition and increase or loss of weight. Although no hard-and-fast rules can be laid down, the following is a good diet list:—

Soups.—Mutton, chicken, oyster, turtle, barley, rice, pea, bean.

Fish.—All that agree—boiled, baked, stewed, or broiled—not salt fish.

Meats.—Beef, broiled or roast; lamb, roast or broiled; mutton, roast or broiled; poultry, roast or broiled; game; sweetbreads; predigested meats (beef peptonoids, sarco-peptonoids, peptonized beef tea, beef jelly, etc.).

Eggs.—Raw, poached, or boiled.

Vegetables.—Greens, lettuce, celery, spinach, asparagus, cresses, cauliflowers, onions, tomatoes, green peas, beans, lentils, and other leguminous vegetables; rice, well cooked, sparingly; potatoes, more sparingly.

Bread.—Wheat and gluten bread, toast, milk-bread toast. Bread should be at least one day old, and only a small quantity should be taken.

Fruits, etc.—Oranges, lemons, pears, apricots, peaches, grapes, green figs, and dates; apples baked, but not raw; walnuts, and other nuts, sparingly.

Drinks.—Fresh water, but Apollinaris and other carbonated waters sparingly; hot milk, cream, egg-nog, lemonade, sherbet, alcoholic drinks as prescribed (whisky, wines, and malt liquors), malt preparations, coffee, tea, cocoa, chocolate more sparingly.

2. *Clothing.*—Too much clothing does harm, yet it is essential that the body should be encased in woollen garments worn next the skin. Some patients find it desirable to wear a piece of wash-leather next the skin and over the affected joints, but often this plan leads to abuse, and in the majority of cases is unnecessary. Many rheumatoid cases feel cold and damp to a much greater extent than ordinary rheumatics, and this has to be taken into account. They are also particularly sensitive to changes in the wind, cold easterly and north-easterly winds being more especially felt.

3. *Exercise.*—In acute cases, where there are fever and great pain, the patient must be confined to bed, but on no account should this be continued a day longer than necessary, and everything must be done to encourage the patient to move and use the joints as much as possible. Half the battle is to induce the patient not to give up doing things, for once a joint is allowed to stiffen and become useless, many months of treatment will be required before it becomes usable again. If the pain be very severe, a light splint may sometimes be used for short periods, but as soon as possible gentle passive movements and massage must be begun. In the more chronic cases, rest in bed is a mistake, and the patient should be ordered a moderate amount of exercise. If unable to walk out-of-doors, fresh air should be obtained by carriage driving or in a Bath chair, and, as the case becomes less acute, graduated gymnastics, special movements, passive exercises, and the use of Zander machines and of pulleys and weights are all of great help. In no circumstance is force or violence to be used or recommended; everything must be done gently and progressively, and with as little pain as possible.

4. *Climate.*—As far as possible no rheumatoid patient should be allowed to live in a damp, cold climate, on heavy clay, or at the bottom of a valley. The ideal climate is bright, sunny, and dry, and the soil should be sand or gravel, with no subsoil water. In this country this is hard to find. The seaside is not suitable, but these cases often do well on a high moorland, where the moisture runs off quickly—especially in summer. Wherever possible the patient should winter in a dry, warm atmosphere, as for example in Egypt (Assouan for preference), or at Biskra in Algeria. As a rule the northern Mediterranean seaboard is not advisable. Some cases do very well at Seville, a place where the disease is practically unknown amongst the natives. But it must be borne in mind that rheumatoid patients require comfort and good food, and therefore it is better to live at home

than go where these cannot be obtained. Many have found benefit from a visit to the dry Karoo of South Africa, or to some of the dry places in Western America, but these are not available to the ordinary patient. As a rule a sea voyage is not desirable, but the mere rest and absence of worry may do good. Plenty of fresh air and sunshine are of the utmost importance.

II.—VACCINES.

We know no specific vaccine for this disease. Looking upon it as an infective condition, the question of a general antitoxin or vaccine naturally arises. So far such has not been found, but the writer and others have succeeded in having micro-organisms isolated from the blood of certain acute cases, and in having vaccines prepared which, when injected, have been found to give very great relief from pain and a marked improvement in the joint condition. The cases so treated have been comparatively few in number, and this line of treatment is mentioned to draw attention to what may materially help in certain of the more acute cases. Painter, of Boston, has also used a vaccine in joint conditions resembling rheumatoid arthritis, but he used it as a stock vaccine, and did not isolate the individual micro-organism in each case; hence, probably, his disappointing results. A few other cases corresponding apparently to typically acute rheumatoid arthritis have been benefited, and the disease apparently arrested, by the injection of the polyvalent antistreptococcic serum. Warren Crowe has reported some cases improved by the use of a vaccine made from a staphyloid coccus isolated from the urine. Cases have also apparently been cured or greatly improved by the use of a vaccine prepared from the streptobacillus found in pyorrhœa alveolaris. Many cases do undoubtedly improve by vaccine treatment where pyorrhœa exists, but there are many cases which give most disappointing results. An American preparation, called phylacogen, has been extensively used, but the results obtained have not been encouraging. It is a sterile aqueous solution of the metabolic substances generated by bacteria, but does not contain the bacteria themselves. This is injected subcutaneously or intravenously. For rheumatoid cases the preparation most used is composed of the *Streptococcus rheumaticus* and a basic mixed infection.

Although our experience is too limited to dogmatize, there can be no doubt that a comparatively large number of cases of rheumatoid arthritis, mostly acute in character, have been benefited by the use of vaccines. Such being the case, it is incumbent on the physician in all acute cases to have a thorough bacterial examination made, and if possible to have a vaccine prepared. At the same time it cannot be too strongly urged that vaccine treatment in this disease is still in its experimental stage.

III.—DRUGS.

Treatment by drugs may be classified under three headings: (1) Those substances which, when administered internally, are antagonistic or antitoxic to the rheumatoid poison, or which enter into conjunction with it and thereby assist in its elimination; (2) Those substances which act by improving the general tone of the body, and those whose action is more or less indefinite, and which have been given empirically and to relieve symptoms; and (3) Those substances which are of use when applied externally.

1. In the first group we know of no substance having any certain antagonistic action, except it be those vaccines already mentioned. We are therefore forced to turn our attention to those drugs which have been found useful owing to their power of entering into conjunction with the rheumatoid poison and thus assisting in its elimination. To this group belong guaiacol carbonate, benzosol, salol, and quinine salicylate. Their action in the first instance seems primarily to be in the intestinal canal, where they decompose with varying rapidity. After being split up into their component parts, they are absorbed, and, in the blood, enter into combination with the toxic albumins, and thus render their elimination easier. The longer the substance takes to decompose, the greater its local action; and, in inverse ratio, the greater the rapidity of decomposition, the greater the rate of absorption and the eliminative power. Apparently the various substances do not act with certainty or regularity, or they are governed by factors of which at present we are ignorant. Thus, one case will do well on guaiacol carbonate, whereas another will do better with the quinine salt. Cases have occurred which,

while unresponsive to one of these drugs, when put on one of the others have been followed by an increase in the amount of urine excreted, which often gives off a volatile matter with an unpleasant odour. This has always been followed by an immediate improvement in the joint condition. It is therefore obvious that, while one salt had not produced an easily excretable combination, the other salt had. The large majority of cases respond best to guaiacol carbonate. It may be administered in doses of 5 to 10 gr. three times a day in powder, pill, or cachet. It is usually readily taken, with little or no symptom of intolerance. After ingestion it is decomposed throughout the entire length of the small intestine, giving off guaiacol, which is absorbed into the blood, and carbonic acid. The total process of decomposition is slow, but within an hour or so the guaiacol can be traced in the urine, and as only a small quantity exists in the blood at one time, it can never become dangerous.

Benzosol is slightly soluble in the stomach, and more so in the intestines. It splits up into guaiacol and benzoic acid. It is given in doses of 5 to 10 gr. three times a day, and acts much as does guaiacol carbonate. Salol may be given alone in 10-gr. doses, but it acts better when combined with quinine salicylate, and it may then be given in 5-gr. doses. It splits up in the intestines into phenol and salicylic acid, both of which are rapidly absorbed and form compounds with the toxic products, and so assist their elimination. Quinine salicylate may be given in 4- to 10-gr. doses, with or without salol. Its action is similar.

2. In the second class are those drugs which have been found useful by improving the general tone of the body—the most important being iron and arsenic. They are best given in conjunction, either in a pill or mixture, probably the best preparation of iron being the syrup of the iodide. Many prefer to combine the iron with quinine. Arsenic may be given as the B.P. liquor, or as the liquor sodii arsenatis. Iodine and the iodides are commonly supposed to be beneficial, iodide of iron being said to have a special action. As a tonic it is excellent, but beyond that it has no influence. Barr strongly recommends the free use of lime salts, and amongst many other remedies are the alkalis, actæa racemosa, fraxinus excelsior, colchicum, etc., which all have their advocates, but are of little lasting avail. Quinine has already been spoken of. The salicylates may occasionally give relief, as aspirin usually does, but their action does not seem to be curative. Guaiacum has been largely used, and abroad ichthyol is a favourite remedy. Colloidal sulphur considerably helps in some cases. For the relief of painful cramps, Dr. Garrod recommends hyoscyamus. Morphia is occasionally necessary for the relief of pain. Thyroid extract helps in some cases, especially where marked vasomotor phenomena are present, but its use cannot be generally recommended. An extract of thymus and glycerin has been recommended by Dr. Solis-Cohen, and the late Dr. Hyde tried an extract of joint-tissue. Neither remedy has been successful to any great extent. Radium has latterly been strongly recommended, and is most frequently administered in water which has been made strongly radio-active. The reports so far published record only fairly satisfactory results. Fibrolysin, injected subcutaneously, helps in many cases in relieving stiffness, but has no apparent effect on pain. It is principally used to prevent the occurrence of deformities. Care has to be taken not to give too many or too frequent injections, as some patients exhibit a marked rise in temperature and a general exacerbation of the joint symptoms from its use.

3. For external use the best drugs are—guaiacol, which should be applied in equal parts with olive oil, or in the proportion of one to six of weak tincture of iodine; methyl salicylate, either pure or with olive oil, lanolin, or vaseline; mesotan (deodorized methyl salicylate) one in three, with olive oil or lanolin. After the preparation has been applied to the skin it should be covered over with lint, guttapercha tissue, and a bandage, or else with a glove. The principal objection to guaiacol, and to a less extent to methyl salicylate, is its smell; in private practice, therefore, mesotan answers best, but must be remembered some patients exhibit a marked intolerance to it. Oil of clove masks the smell to a certain extent, but not entirely. When applied externally, they all produce a slight numbness, a sense of coolness, and a feeling of relief. They are absorbed rapidly and can be traced in the urine. They may produce a reddening, and occasionally, if applied too strong, a blistering of the skin; so care must be taken with the first few applications.

Carbolic acid is used, in the strength of 1 in 30 or 40, as a warm fomentation, renewed every two or three hours, and acts as a local anæsthetic and analgesic. In acutely painful joints it may give great relief.

Menthol may be combined with any of the foregoing, and is often useful. Apart from these, practically every liniment has been tried; all are more or less unsuccessful in the majority of cases in accomplishing more than the temporary relief of pain. Iodine frequently relieves pain, and may diminish the size of a joint: the writer prefers to combine it with guaiacol or methyl salicylate. A small cantharides blister often markedly relieves pain and lessens a swollen joint, and occasionally much relief may be got by freely and repeatedly blistering the spine as recommended by Dr. Latham. Chaulmoogra oil, cod-liver oil, oleate of mercury and morphia, and unguentum hydrargyri co., are often useful to rub into a joint, or for strapping. Ordinary strapping is of use in many cases in lessening the size of a joint, and it certainly relieves pain. It is most usefully applied to a knee or wrist.

IV.—ELECTRICAL, THERMAL, AND OTHER SPECIAL TREATMENT.

Electrical Treatment often gives much relief, probably most good being gained from the use of a weak continuous current used twice a day. It should be applied directly to the affected joint. The interrupted current does not give such good results. In no case should electricity be used in acute cases. It is particularly of service where there is much wasting, and the application must be to the individual muscles. The electric bath has also been used, but it does not seem to act otherwise than as a general nerve tonic. Latterly, high-frequency currents, static electricity, and sinusoidal currents have all been used, and occasionally some good may be obtained, but their use is not required as a routine treatment. Cataphoresis helps materially in the more chronic forms in relieving pain and reducing the size of a joint. It is also found useful in relieving stiffness. The drugs mostly used for the ionization are salicylate of soda and iodide of potash.

Thermal Treatment.—The use of hot mineral waters and other accessories is of the utmost value, but while one can safely say this, it must be remembered that different waters are most advantageously employed in different cases. Many things must be taken into account besides idiosyncrasy, in ordering a patient to a certain spa, and for a certain course of treatment; but broadly speaking, a spa that is at all lowering is useless in this disease. Unfortunately no fixed rules can be laid down, but undoubtedly hot alkaline, or indifferent strongly radio-active mineral waters, with douches and massage, act best; and perhaps next to these, the warm peat baths. In this country Bath and Buxton are probably the most successful. Owing to its situation, Bath is much warmer than Buxton in winter, and hence, in the majority of cases, is the more suitable. Should it be desirable to try the sulphurous waters of this country, Strathpeffer and Harrogate are of use in summer. At the former spa an excellent form of peat bath is employed. Amongst the other spas in this country are Woodhall (iodine) in Lincolnshire, and Llanwarmarch (bromine) in Wales, both of service in certain cases. Abroad we have the thermal waters of Aix-les-bains, La Bourboule, Mont Dore, Aachen, Wildbad, Wiesbaden, Töplitz, Homburg, Kissingen, Assouan (Egypt), Hammam R'Irha and Hammam-Meskutine (Algiers), Arkansas, Virginia, and Banff (America). When anæmia and debility are prominent symptoms, the chalybeate waters of Langenschwalbach, Rippoldsau, Spa, and Franzenbad are of use.

Mineral waters are administered both internally and externally. Moreover, the balneological treatment is only part of the cure, as by going away from home many of the daily worries are left behind, and the patient has the advantage of change of air and scene, and superintendence of diet and mode of life.

Why mineral waters should relieve rheumatoid patients is not quite obvious, but that it does so we know from experience, and also that it cannot altogether be replaced by other modes of treatment. To explain it scientifically is difficult, but it is probable that most mineral waters act beneficially on account of their radio-activity, and doubtless partly by causing increased perspiration and expiration of watery fluid from the lungs, with consequent increased imbibition of fluid and flushing of the body channels; also by their sedative action on the nervous system, and by their stimulating effect on the circulation as a whole.

In rheumatoid arthritis, douche massage is the best form in which to administer baths. The massage combined with douching is much more effectual than either remedy alone, although great benefit is derived from additional dry massage on days on which the patient is not bathed. Massage is specially indicated in chronic cases, and where there are much stiffening, fixation of the joints, and muscular wasting. It may be combined with electricity, or with passive or active movements. At first it should be applied very lightly, and principally to the muscles, and then, as it is found the patient can stand it, to the joints, getting more forcible and deeper as the case goes on. Massage *à friction* is the most suitable form to use, but in addition, gentle kneading and squeezing of the tendons and fibrous parts may be practised.

Should douche massage baths not be advisable, ordinary immersion, with or without douches, vapour baths, peat baths, radiant heat or electric baths, are all of use in special circumstances. Plombières douches are often most useful in cases with colitis, and sometimes they seem not only to cure the local condition, but to help greatly the general joint condition.

If there be much rubbing of ulcerated cartilages one upon another, with great pain, relief may sometimes be got by extension by weights. This method is particularly useful in the case of the knee-joint. Heavy weights are unnecessary. Again, if there be much tension of a joint from fluid, good may be done by tapping the joint, great care being taken to see that the syringe is aseptic.

The prevention of deformities is of great importance, and this can usually be secured by massage, etc., and the use of light springs which are applied to exert their strength in the opposite direction to that in which the deformity is occurring. In the case of the fingers and hand, the springs are best applied attached to a glove, which may readily be drawn on and off. Should ankylosis occur, it may be desirable to give an anæsthetic and move the joint, or possibly the question of a more drastic operation may arise.

Bier's method of passive congestion by the use of a Martin's bandage may in some cases and for a time greatly relieve pain and swelling, but more than that it does not seem to do.

Surgical Treatment.—Recently surgical treatment of rheumatoid arthritis has received a good deal of attention both on the Continent and in America, and good results have been recorded both for the relief of ankylosis or locking of a joint, and with the view of arresting the spread of the disease. In one class of case the operation can be intended as a local measure only, whereas in the other it is done with a view to eradicating the disease. Data at present do not allow us to speak authoritatively on either question, but it seems to the writer that excision or removal of bony nodules must be a comparatively rare necessity. For one thing, bony ankylosis is very rare in true rheumatoid disease, and although bony excrescences and fibrous adhesions are common in the chronic forms, yet the stiffened joints usually yield to milder forms of treatment, and even if ankylosis has occurred, it is but in few cases one would recommend excision or the formation of a new joint, and only if the ankylosis were the cause of such serious crippling as to affect the general health or wage-earning capacity of the patient. Recent advances in surgical methods have made the question of the formation of new joints one which in some cases must be considered, and the results reported are so good that this method of treatment holds out great hope of benefiting those who are incapacitated from using some of the more important joints. These methods would only be of service when the disease has assumed a quiescent stage, and where one, or at the most two joints, were involved. In these cases there is no question of cure, but it is quite otherwise in the acute cases, where excision, incision, and scraping of the joint tissues, or incision only, have been practised, with the idea of arresting the spread of the disease. The operations so far have been confined to one, or at most two joints, and many of the cases have given most encouraging results, as it has been found that by the removal of the diseased cartilages and synovial membranes of one joint, not only is that joint improved, if not cured, but the other affected joints are also improved. As our knowledge at present stands, surgical interference should only be recommended in the chronic cases where real bony ankylosis has occurred, or where there are such rigid fibrous union and locking of the joints as to resist all gentler methods, and where the joint thus fixed seriously interferes with the patient's health (as in the case of the jaws) or his wage-earning capacity ; and in the acute cases

only where the disease is so severe and painful as to resist all other methods of treatment, and where the patient is fully informed of the dangers and probabilities of the operation. As a rule, once a stiffened joint has been made to move by massage, passive movements, and baths, the atrophied muscles quickly respond to treatment. Electric and other stimuli soon cause the tissues to regain their tone and usefulness.

SUMMARY.

In the acute stages the patient should be kept quiet and on a light, nutritive diet, being encouraged, if possible, to use the joints gently, and for short periods; but if too painful, the limb may be allowed to rest for a short time in a splint. The use of vaccines must be considered, and, where any micro-organism can be isolated vaccines should be employed. The joints should be painted with guaiacol and olive oil or iodine, or with methyl salicylate or mesotan, or fomented with carbolic-acid fomentations. Internally, guaiacol carbonate or salol with quinine should be given, and, as an occasional tonic, iron and arsenic. If sleep be not readily obtained, this must be attended to, as must also be the various functions and organs of the body. If the patient can stand it, light massage and baths, for short periods, may be ordered. As the case becomes more chronic, the thermal treatment must be pushed, increased exercises, electricity, and gymnastics now being also indicated. Internally, the treatment must be as in the acuter stages, with possibly the free use of cod-liver oil and maltine. Above all, there must be persistence and patience. *Gilbert A. Bannatyne.*

RHINITIS.

Acute Nasal Catarrh.—In the *earliest stage*, when the patient has a burning or pricking sensation in the nose or throat, and is feeling feverish and ill, but before any definite symptoms of catarrh have commenced, various remedies have been recommended to cut short the disease. One of the best is a full dose (10 gr.) of Dover's powder at bedtime. The diaphoretic action of this drug may be increased by taking a hot bath and plenty of hot drinks. Another remedy sometimes successful is a single large dose of quinine, 5 to 10 gr. given in solution; or the ammoniated tincture of quinine may be prescribed in drachm doses every two hours for three doses. Others recommend ten drops of spirit of camphor to be taken as a single dose; essence of cinnamon and carbolic acid in 1-gr. doses taken every hour for six hours, have also proved successful. Whenever possible the patient should remain in bed at least one day.

In the *second stage*, when the cold has really commenced, the ordinary household remedies should be employed. The patient should have a hot bath in a warm room and go straight to bed. He should take plenty of hot drinks, such as hot lemon, or hot whisky and water. Aspirin in 10-gr. doses relieves the discomfort and induces sleep, or the following mixture may be prescribed:—

℞ Liquoris Morphinæ	♏ x	Aquæ Chloroformi	q.s. ad	℥ ss
Liquoris Ammonii Acetatis	℥ ij			

One tablespoonful to be taken every two hours for four doses.

A hot steam inhalation, made by adding 1 drachm of tincture of benzoin, or 1 drachm of a 10 per cent solution of menthol in spirit, to a pint of water at a temperature of about 130°, will often alleviate the local discomfort. The patient should inhale the steam through the nose for four to five minutes, and the inhalation may be repeated three or four times a day provided he remains in a warm room. The best local applications are soothing ointments, or oily sprays. An ointment containing menthol 5 gr., or thymol or camphor 5 gr., with chloretone 10 gr. and boric acid 15 gr. to the ounce, may be prescribed, a piece about the size of a pea being inserted up each side of the nose and sniffed up two or three times daily. Similar drugs, with eucalyptus instead of boric acid, may be dissolved in oil and used as sprays in a suitable atomizer. In addition to this treatment the patient's general health should be attended to. The diet should be light and nutritious, and a brisk purge should be given. If these directions can be followed out for two or three days, a cold can generally be cured. This is of importance in the very young, in the aged, and in weakly persons, and it is especially important in singers and other professional

voice users. Solution of cocaine as a spray, or ointments containing cocaine, are frequently recommended, but their use should be absolutely forbidden. The constant use of cocaine is exceedingly pernicious, and it is at all times a dangerous drug to place in a patient's hands. The use of adrenalin is equally dangerous.

In the *third stage*, when the sneezing and irritation have subsided, when the profuse watery discharge is lessening and becoming more sticky and more mucopurulent, a simple alkaline nasal lotion such as the following should be prescribed :—

℞	Sodii Bicarbonatis		Sacchari Albi	gr. v
	Boracis		Aquæ Destillatæ	q.s. ad ℥j
	Sodii Chloridi	āā gr. ij		

It is convenient to prescribe this lotion three or four times the above strength, with directions for diluting it sufficiently with warm water before use. It may be sniffed up the nose from a cup or glass, or more conveniently be used in one of the nasal irrigators. In children a small glass syringe should be used and the fluid injected as gently as possible. The douche should never be employed. The use of the ointments as above described may be continued. As the patient becomes convalescent, the best remedy is a change of air to the country or seaside, together with a suitable tonic. Cod-liver oil may be given to children, perchloride of iron and strychnine to adults.

Prophylaxis.—Much may be done to prevent colds. Children who are particularly prone to nasal catarrh should be examined with a view to the detection and removal of adenoids. If thin and ill-nourished they should be put on a diet containing a large proportion of fats, and cod-liver oil prescribed. In adults any chronic nasal affection should be remedied, especially any cause of nasal obstruction, such as hypertrophy of the inferior turbinates, polypus, and thickening or deviation of the septum, also any chronic sinus suppuration.

Where no abnormality can be discovered, and the patient seems otherwise in good health, vaccine therapy should be tried, and often proves successful. A cold is an infection, but may be due to several different organisms. If the patient suffers from a mild chronic catarrh with repeated acute attacks, an autogenous vaccine should be made, but in most cases a stock vaccine such as Wright's anti-catarrh vaccine is most likely to be successful. This vaccine contains varying doses of the most common organisms usually met with in nasal catarrhs. Treatment should be commenced with a small dose in the autumn and repeated at monthly intervals during the winter. (*See also* Vaccine Therapy.)

Fibrinous Rhinitis (**Croupous or Membranous Rhinitis**).—When fibrinous rhinitis is suspected, the nasal secretion should be examined for the Klebs-Löffler bacillus, both by staining films of the discharge and by cultures. If the organisms be found, the patient should be isolated, and not allowed to associate with other children until the bacilli have disappeared. The child must be kept quiet, but is usually not sufficiently ill to be in bed. Plenty of good food, and a tonic, such as Easton's syrup, should be prescribed. The nose should be frequently washed out with a weak solution of boric acid (10 gr. to the ounce), or with salt and water (1 drachm to the pint). Weak boracic ointment, or, better still, dilute nitrate of mercury ointment, prepared according to the following formula, should be applied to the anterior parts of the nose with a brush :—

℞	Unguenti Hydrargyri Nitratis	gr. xl	Paroleini	q.s. ad ℥j
	Olei Amygdalæ	℥ss		

Under this treatment the child usually makes a complete recovery in three to six weeks. The disease is never followed by serious sequelæ such as paralysis, and never gives rise to the severer forms of diphtheria in others. Attempts to remove the membrane should be avoided, as they cause bleeding and discomfort, and the membrane quickly re-forms. The use of antidiphtheritic serum has so far proved useless.

Chronic Rhinitis.—Both local and general treatment are necessary. The plethoric, gouty, or alcoholic patient must be treated by regulation of the diet, restriction of alcohol, and regular exercise in the open air. Many men who lead a sedentary life without regular exercise, and eat and drink too much, are greatly benefited by undergoing an annual 'cure' at a health resort, such as Carlsbad, Contrexéville, or Marienbad. If a visit of this kind be impossible, a morning dose of Epsom or Glauber's salts or of some natural aperient

vater will be beneficial. An occasional Turkish bath is often useful. Late hours, over-ıeated, ill-ventilated, crowded rooms, and other insanitary surroundings, should be avoided.

In the anæmic, thin type of patient the diet should be nourishing and include plenty of fats. Cod-liver oil may be given if the patient can digest it; an iron and strychnine mixture often does good. The patient should live in well-ventilated rooms, take a fair mount of outdoor exercise, and wear suitable clothing. A change of air, especially to a dry, bracing place, is of the greatest benefit.

In old or delicate persons the question of change of climate must be considered. Although the affection is not serious, it may be impossible to cure it if the patient remains in the ordinary English climate during the winter. Such patients should be sent to the he South of England, or to a warmer climate such as Madeira or Egypt.

Local Treatment.—If there is no gross abnormality in the nose, and the patient's health s good, the affection will usually yield to simple local measures. An alkaline lotion to be niffed up the nose or introduced with a nasal irrigator should be used regularly at least wice a day. The following are examples of useful formulæ :—

℞	Sodii Bicarbonatis		Sacchari Albi	gr. v
	Boracis	āā gr. iij	Aquæ Destillatæ	q.s. ad ℥j
	Acidi Carbolici	gr. j		
℞	Sodii Bicarbonatis		Sacchari Albi	gr. v
	Boracis		Aquæ Destillatæ	q.s. ad ℥j
	Sodii Chloridi	āā gr. ij		
℞	Glycerini Boracis		Aquæ Destillatæ	q.s. ad ℥j
	Spiritus Rectificati	āā ♏x		
℞	Sodii Bicarbonatis		Eucalyptolis	♏ $\frac{1}{12}$
	Boracis	āā gr. iv	Mentholis	gr. $\frac{1}{24}$
	Sodii Benzoatis	gr. $\frac{1}{6}$	Aquæ Destillatæ	q.s. ad ℥j

It is convenient to prescribe these lotions four times the above strength, and to direct he patient to add ½ oz. to 1½ oz. of warm water for use. The second and fourth prescriptions may be given in the form of compressed tablets, a great convenience to patients who avel. When one lotion fails, another should be tried.

If this treatment fails, oily sprays or ointments may be used. The following are eful formulæ :—

℞	Mentholis		Acidi Borici	gr. xv
	Camphoræ	āā gr. iij	Paraffini Mollis	q.s. ad ℥j
℞	Mentholis	gr. v	Paraffini Liquidi	q.s. ad ℥j
	Olei Eucalypti	♏xx		

A small piece of the ointment may be inserted up each side of the nose twice daily ter cleaning the nose with a lotion. The oil may be used with a suitable spray.

Where there is any cause of nasal obstruction, such as hypertrophy of the turbinates, deflection or thickening of the nasal septum, it must be dealt with (*vide infra*). If the sal obstruction depends mainly upon congestion of the inferior turbinates, the best atment is the application of the galvano-cautery. Local anæsthesia should be proced by packing pledgets of wool soaked in a 10 per cent solution of cocaine round the terior half of one inferior turbinate. After twenty to thirty minutes the part will be und completely anæsthetic. With the red-hot cautery point two or three horizontal es are drawn along the inferior turbinate from behind forwards. Care must be taken avoid burning the septum, and also to prevent the heated wire coming in contact with skin of the vestibule. Three or four days later the other inferior turbinate should be uterized, and, if necessary when these wounds have healed, the posterior ends of the binates should be similarly dealt with. These little operations are followed by very ght reaction, and after the first day the use of nasal lotions or ointments as above scribed may be continued.

Linear superficial cauterization is better than puncture with the cautery, as it is followed by less reaction and by more shrinkage. The puncture method consists in plunging the red-hot cautery point deeply into the tissues of the inferior turbinate, without destroying more of the surface epithelium than is necessary. This is done to avoid the danger of adhesions, but if care be taken there is no risk with the ordinary method.

When the electric cautery is not at hand, chemical caustics may be used. They are very effective, but it is a little more difficult to limit their action. The inferior turbinate is anæsthetized with cocaine as above described, and then a bead of nitrate of silver or of chromic acid fused on a probe, or fuming nitric acid on a wooden or glass rod, is applied to it. Any excess of acid is immediately wiped away with wool mops. These applications sometimes produce considerable pain or discomfort, and must be used sparingly.

When the nasal passages are excessively narrow, the cautery may be insufficient to clear them, and it is impossible to cure a chronic catarrh without restoring nasal respiration. Then it may be necessary to remove portions of even healthy inferior turbinates, and anterior turbinectomy, alone or combined with posterior turbinectomy, may be required. Enough should be removed to restore free nasal breathing, but no more of the turbinate should be sacrificed than is necessary to attain this end ; therefore complete turbinectomy should never be attempted. For the methods of performing these operations *see* HYPERTROPHIC RHINITIS, *infra*.

Hypertrophic Rhinitis.—Hyperplasia of the inferior turbinates is usually associated with, and due to, chronic catarrhal rhinitis. If there be not too much hyperplasia, the treatment should be carried out as for chronic rhinitis. Simple cleansing lotions should be prescribed, and usually it will be necessary to reduce the enlarged turbinates with the galvano-cautery (*see* CHRONIC RHINITIS, *supra*). If this treatment fail, if the hyperplasia be excessive, or if the nose be unduly narrow, more active measures must be adopted. If the anterior ends of the inferior turbinates are in contact with the septum, and if this enlargement does not disappear under the application of cocaine, anterior turbinectomy should be performed. If only the posterior ends of the turbinates are hypertrophied, they may be removed with snare or cutting forceps. If the whole of the inferior turbinate is hypertrophied, a strip must be removed from the free border of the entire length of the turbinate, but no more should be removed than is necessary to restore free nasal respiration. These operations may be briefly described.

Anterior Turbinectomy may be carried out under local anæsthesia, or under nitrous oxide gas alone or followed by ether. In some cases it may suffice to remove portions of the anterior end of the turbinate with punch-forceps or nasal scissors, or it may be possible to snare off a large portion with a strong wire snare. When it is wished to remove a considerable piece of bone, as is necessary when the nose is unduly narrow, the following method will be found convenient : With nasal scissors or shears, or with strong cutting forceps such as Mahu's, the attachment of the inferior turbinate is divided from the outer wall of the nose. The wire of a stout snare is quickly slipped into the notch thus made and the anterior end of the turbinate cut through (*see Fig.* 58). This operation is followed by little bleeding, and the after-treatment consists in keeping the nose clean with boric acid lotion, and in applying an ointment such as the menthol and boracic ointment (*see* CHRONIC RHINITIS).

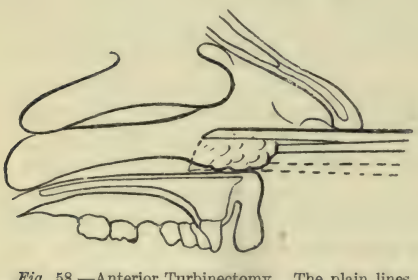


Fig. 58.—Anterior Turbinectomy. The plain lines show the blades of the scissors, the dotted lines the barrel of the snare and the wire loop.

Posterior Turbinectomy.—The posterior ends of the inferior turbinates may be removed with the cold wire snare. This is introduced through the anterior nares, and the wire loop is guided by sight over the posterior end of the turbinate, or held in position with the tip of the left forefinger introduced through the mouth. With the former method local anæsthesia is sufficient. The inferior meatus is packed with pledgets of wool soaked in a 10 per cent solution of cocaine and suprarenal extract. These are left in position for about half an hour, so as to obtain the maximum shrinkage of the mucous membrane. It is now usually possible to see the posterior end of the turbinate by anterior rhinoscopy. The wire loop is passed down the inferior meatus and adjusted over the posterior end of the turbinate partly by sight and partly by feel. A strong snare with a fairly thick wire is necessary, as the tissues are often tough. It is convenient to give the loop a double twist, so that as the wire is tightened up it curves over towards the part to be removed and thus prevents the tendency to slip off. This double twist is effected by protruding

small loop of wire from the snare and bending it sharply over in the direction in which it is desired that it should subsequently curl. Another quarter of an inch of the loop is then protruded from the snare, and the loop bent sharply back so as to lie in a line with the barrel (*see Fig.* 59). When in position the wire loop should be quickly tightened, so as to obtain a firm hold of the part, and then slowly pulled home, so that the cutting may be done slowly and the vessels obliterated as they are divided. In this way there will be very little bleeding.



Fig. 59.—Method of shaping wire loop or snare. The plain line shows the wire loop as introduced into the nose, the dotted lines the positions it successively assumes as it is tightened.

If it is impossible to perform the operation in this way, or if for some other reason, e.g., for the removal of adenoids, a general anæsthetic is given, the operation may be carried out in a similar way with the snare; but the wire loop is guided over the posterior end of the turbinate and held in position by the tip of the left index finger, which is introduced through the post-nasal space (*see Fig.* 60). An easier method is to clip away the posterior ends with punch forceps, such as Grünwald's or Mahu's, which can be more easily felt and guided by the finger in the post-nasal space.

In rare cases of extreme turbinal hypertrophy or of unduly narrow noses, it may be necessary to remove a slice from the whole length of the turbinate. Successive portions may be removed with the snare, or the free inferior border of the turbinate may be clipped away with a pair of punch forceps or scissors. With cocaine and adrenalin, with or without general anæsthesia, it is usually possible to see accurately what is being done, and to clip away just sufficient to give a free passage through both nostrils. No more tissue should be removed than is absolutely necessary. The inferior turbinate is the most valuable structure in the nose, and its total, or too free, removal is apt to result in an intractably dry condition of the nose and whole upper air-tract. After any operation on the turbinate, especially when performed under adrenalin, the danger of hæmorrhage four to six hours after the operation must be borne in mind, and the patient never allowed to go beyond reach of his surgeon. He must take the precautions described under anterior turbinectomy, and follow the same after-treatment.

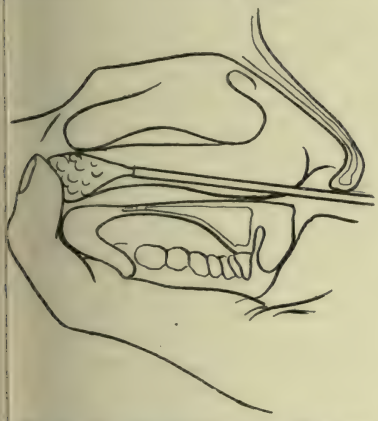


Fig. 60.—Posterior Turbinectomy. Wire loop of snare held in position by left forefinger.

Rhinitis Sicca.—Rhinitis sicca occurs in three distinct conditions: (1) In anæmia, often associated with indigestion and constipation, when the nasal mucous membrane appears pale, shrunken, and dry. (2) In plethoric, gouty, or alcoholic individuals, in whom the mucous membranes will usually be found red, congested, and covered with small black crusts. (3) A purely local form due to the inhalation of dust, especially certain forms of fine dust. Workers in certain industries, such as brushmakers, metal grinders, millers, and librarians, are liable to get a somewhat severe form of the affection without any predisposing cause.

The local treatment is most important, the indications being to cleanse the nose and to prevent the formation of crusts. The nose should be washed out two or three times daily with an alkaline solution (*see* Chronic Rhinitis), which may be modified by substituting chloride of sodium or chloride of ammonium (5 gr. of either to the ounce) for the carbolic acid. To prevent the formation of crusts the washing should be followed by spraying the nose with oil, or inserting an ointment such as the following:—

℞ Mentholis, Camphoræ, Acidi Carbolici āā gr. iij, gr. j | Acidi Borici gr. xv, Paraffini Mollis ℥j

Fiat unguentum.

There is a special tendency for the crusts to collect on the most anterior part of the mucous membrane of the septum. They often cause much irritation, which leads to picking the nose or to violent efforts to detach them. This causes excoriation and ulceration of the mucous membrane, repeated epistaxis, and ultimately perforation of the septum. This condition must be met by energetic application of oil or ointment to the anterior part of the septum, and if the patient's occupation entail work in a very dusty atmosphere, it may be necessary to change it, or he may wear wool in the affected nostril and breathe through his mouth whilst at work. In certain dangerous trades a proper respirator must be provided.

The general treatment consists in correcting any underlying constitutional disturbance, and, if possible, removing the patient from his dusty surroundings.

Atrophic Rhinitis.—This disease generally begins in childhood as a purulent rhinitis, but the characteristic symptoms—the crusty discharge and the fœtid breath—are more usually delayed until adolescence. As the atrophic changes are progressive, prompt recognition and early treatment are essential to obtain the best results. It must be borne in mind that the crusts and the stench are *secondary* symptoms, depending upon the fact that the discharge is retained in the nose for a long period.

The mucopurulent nasal discharge, sometimes in part derived from one or more of the accessory sinuses, tends to collect in the nose because: (1) It is unduly tenacious owing to atrophy of the secreting glands and diminished watery secretion; (2) The abnormal width of the nasal passages impairs the power of blowing the nose; and (3) The ciliated epithelium is replaced by squamous cells. The discharge retained in the nose, exposed to the passage of the respiratory air, loses water by evaporation and dries into crusts, and the germs in the air are deposited in the crusts, develop, and cause decomposition of the discharge, with the resultant fœtid odour of the breath. Further, the products of decomposition are irritants and set up fresh discharge. These pathological conditions explain the rationale of successful treatment and the intractable nature of the affection.

The nose must be syringed regularly with a mild antiseptic lotion. A solution of ordinary salt, a teaspoonful to the pint, to which a little Sanitas or permanganate of potash is added, a weak boric acid lotion, or any of the mild alkaline lotions (*see* Chronic Rhinitis) may be used. Strong lotions should never be employed. The nose should be syringed; sniffing up is useless, and the nasal douche is not nearly so effective, whilst it is more dangerous. Higginson's syringe is the best. About a pint of fluid should be used each time, and injected in various directions until the nose is absolutely clean. It is advisable for the doctor himself to supervise the syringing until he has properly instructed the patient. After syringing, the interior of the nose should be inspected, and any remaining crusts should be removed by directing a stream of water directly on to them, or, better still, by gently detaching them with a mop of cotton-wool dipped in a solution of peroxide of hydrogen. When the nose has been thoroughly cleansed, it should be lightly packed with a strip of cyanide gauze about one inch broad and nine to twelve inches long. This prevents the patient breathing through the nose, and also, by setting up a certain amount of irritation, renders the nasal discharge more watery. The packing should be worn day and night, and changed only when the nose is syringed. The patient soon becomes tolerant, but at first the packing may cause considerable discomfort or headache and may interfere with sleep. At first, also, when the discharge is profuse, it may be necessary to renew the packing two or three times a day. If the packing causes much pain, or if it sticks and causes bleeding on removal, plain sterilized gauze should be used and should be soaked in oil or ointment, such as the dilute nitrate of mercury or weak boric acid ointment.

The nose should be syringed and packed at least twice daily until the discharge has apparently ceased. After three or six months, as the case may be, the packing should be omitted, at first for a few hours a day, and gradually increasing the time until it is omitted all day and worn only at night. Many patients, however, prefer to continue the packing owing to the great relief it gives them, and such patients may be instructed to pack the inferior meatus only and to leave the middle meatus clear for breathing purposes. When it has been found that the packing may be safely omitted without the return of the worst symptoms, it may be left off altogether, but the daily syringing must be continued. As already pointed out, the nasal passages are unduly wide and are lined by

squamous epithelium which possesses no cilia. The nose, therefore, is no longer a self-cleansing apparatus, and any dust or dirt in the air, mixed with dry nasal secretion, collects in the nose and forms small dry mucous crusts all over the mucous membrane. If the patient takes a severe cold, there is apt to be a partial return of the symptoms. It will therefore probably be necessary for the patient to syringe his nose regularly every morning for the rest of his life. At this stage of the disease the patient may find benefit by spraying the nose with liquefied vaseline or lanolin, or with the ointment prescribed for Rhinitis Sicca, *supra*. It is the very early cases only, when but slight atrophy has occurred, that can recover sufficiently to be able to abandon all treatment.

In addition to local treatment, the general health must be carefully maintained. The majority of patients are, in the circumstances, in surprisingly good health, but any tendency to anæmia should be corrected. In a proportion of cases, variably estimated at from 10 to 20 per cent, complications, such as suppuration in one of the nasal accessory sinuses, are present. The sinuses most frequently affected are the antrum and the sphenoidal sinus. These complications must be sought for carefully and appropriately treated (*see* Nose, Accessory Sinuses of). The method of packing the nose as above described greatly facilitates the diagnosis.

Numerous other methods of treatment have been from time to time recommended and abandoned, but some may still serve a useful purpose. Massage of the mucous membrane by rubbing it lightly with small pledgets of wool wrapped on a probe has been recommended as a restorative of the nasal mucous membrane. It undoubtedly causes increased vascularity and discharge at the time, and although it cannot restore the atrophied mucous membrane, it is a useful help in thoroughly cleansing the nose, especially if the wool be soaked in peroxide of hydrogen.

Attempts have been made to restore the atrophied turbinates and diminish the lumen of the nasal passages by submucous injections of paraffin wax. The posterior part of the turbinate should be first injected, then the anterior part, and finally a little paraffin may be inserted into the septum also. When a fair-sized turbinate is present, the injections are easy, but when the turbinate is represented by a thin ridge along the outer wall of the nose, they may be almost impossible. Some patients seem to experience benefit, but the treatment is of little real advantage.

Rhinitis Caseosa.—In this affection a large mass of semi-solid material, looking like putty, is found in one nostril, usually surrounded by swollen mucous membrane and œdematous granulations. The treatment consists in clearing the nose. Cocaine and suprarenal extract should be applied to anæsthetize, and to reduce the swelling of, the mucous membrane, and then the putty-like mass should be broken up and removed, partly by blunt hooks and scoops, and partly by syringing the fragments away with mild antiseptic lotions, such as a solution of boracic acid or of Sanitas and salt. When the nose has been cleared, which may require two or more sittings, the granulations will usually subside without further treatment. Sometimes the disease involves the accessory sinuses, especially the antrum. Extensive operations are generally required in these cases, as the sinus is usually filled with material similar to that found in the nose, and its walls are often carious. Sometimes extensive necrosis may be present in the nose, and a general anæsthetic will be required to deal with it thoroughly; or a foreign body will be found and must be removed.

H. Lambert Lack.

RHINOLITHS.—(*See* Nose, Foreign Bodies in.)

RHIZOTOMY.—(*See* Nerves, Peripheral, Surgical Affections of.)

RICKETS.

1. **Prophylaxis.**—The prevention of rickets depends on (*a*) The maintenance of the mother's health and efficiency; (*b*) Improvement of the hygienic conditions; (*c*) Prevention and care of acute ailments; and (*d*) Regulation of the child's diet.

a. Maintenance of the Mother's Health and Efficiency.—Care of the mother during pregnancy and lactation is always important, and it becomes especially so when she is approaching the end of the child-bearing period, or if any of her other children have been rickety. While nursing, her diet requires attention, for the baby depends on her for the

accessory food factor which is now believed to be necessary for the prevention of rickets, and this she has to obtain entirely from her diet. She must therefore have plenty of such foods as milk, butter, eggs, suet, and green vegetables.

Everything that helps to increase the mother's efficiency is of value in the prevention of rickets. If she is inefficient owing to stupidity, carelessness, or intemperance, it may be beyond the physician's power to mend matters; but if her shortcomings are due to ignorance, weak health, overwork, or poverty, something may probably be done. The services of competent child-welfare visitors are of great value in such circumstances.

b. Improvement of the Hygienic Conditions.—Better housing may do much to prevent the development of the disease. When children have easy access to fresh air and sunshine, the chance of rickets developing is much lessened.

c. Prevention and Care of Acute Ailments.—Catarrhal and dyspeptic disorders must be guarded against and promptly treated. It is especially important to secure rapid and complete convalescence after the ordinary infectious diseases of childhood.

d. Regulation of the Diet.—As the main cause of rickets probably lies in defects in the diet, its proper regulation forms a most important means of preventing the disease. The ordinary normal diet of infancy is all that is required.

2. **Curative Treatment.**—The therapeutic indications to be observed in the case of a child who has rickets may be summed up as follows: (*a*) He must have more fresh air and sunshine; (*b*) His digestion must be attended to; (*c*) His diet regulated; (*d*) Certain tonic measures must be used; (*e*) Severe symptoms or complications present have to be treated; and (*f*) Means should be taken to prevent or relieve bony and other deformities.

a. Fresh Air and Sunshine.—The child should be taken out of doors twice daily at least, for as long as possible. In the case of the poor, it is often a good plan to have him left in the open air in his perambulator for the greater part of the day, provided the weather is at all suitable. He must, of course, be warmly clad, because a rickety infant, owing to his excessive sweating and general debility, is particularly liable to chills. If he cannot be taken out, the window should be kept widely open, night and day, and he should be kept in the sunniest room available. When the parents' circumstances permit of it, a stay at the seaside may be beneficial.

b. The Digestion.—Before making any great change in the diet, or giving tonics, it is advisable to consider the state of the digestion and, if this is defective, to take means to improve it. A short course of soda, with rhubarb or with nux vomica and gentian, e.g.:—

℞	Pulveris Rhei	gr. j	Syrupi Zingiberis	℥iij
	Sodii Bicarbonatis	gr. ij	Aquæ Menthæ Piperitæ	qs. ad ʒj
	Ammonii Carbonatis	gr. ss		

M. Thrice daily half an hour before food.

℞	Sodii Bicarbonatis	gr. iij	Infusi Gentianæ Compositi	ʒj
	Tincturæ Nucis Vomicæ	℥j		

M. Thrice daily half an hour before food.

will often so strengthen the digestive powers as greatly to enhance the efficiency of the dietetic treatment. A few doses of grey powder will sometimes be found to facilitate considerably the digestion of the increased fat in the food. Should diarrhœa and vomiting be present, it is of course important to stop them before beginning to give cod-liver oil or otherwise to increase the fat.

c. The Diet.—In all cases, the feeding of the child must be carefully regulated. It is important to see that his meals are reasonable in amount and digestibility, and are given at suitable intervals. The main thing, however, is to ensure that they contain an adequate proportion of fat and protein in such forms as to be easily assimilated.

Should the patient be a young baby on the bottle, a wet-nurse's milk is the ideal treatment for him. Short of this, however, careful modification of cow's milk, so as to make it resemble human milk as nearly as possible, is often very successful. When the child is unable to digest the casein of cow's milk sufficiently for the necessities of his nutrition, the addition of raw meat juice to the bottle is often serviceable.

In the case of children during the second year of life, the first point generally is to see that sufficient milk is being given. Mothers, who are otherwise sensible, will often

e found giving their infants less than half a pint of milk in twenty-four hours, when they hould be having at least three times that amount. It is also advisable that the milk iven should, if possible, be from cows that are properly housed and fed. The milk of hose that are stall-fed on oil-cake contains far less of the necessary vitamines than that f animals that are feeding out of doors on good grass (Mellanby). This is probably one f the reasons why rickets is more prevalent in winter and spring than in summer.

It is important to see that the child is not having a large excess of bread, potatoes, nd other starchy foods, and that his digestion is not being upset by frequent mouthfuls f 'whatever is going'. Oatflour or well-boiled oatmeal porridge, or some such prepara- ion as Chapman's wheatflour, should be given in preference to arrowroot and cornflour, nd cream should be given with them. Proprietary infant foods should not be given, ecause in their preparation much of the accessory food factors are destroyed. Butter nd dripping are good for the older cases; margarine and other preparations of vegetable ils cannot take their place. Yolk of egg—providing, as it does, both protein, fat, and rganic combination of phosphorus—is almost always good for the child. The regular dministration of cod-liver oil in moderate doses is advisable in most cases.

d. Tonic Measures.—The value of alkaline tonics in improving the digestion has lready been referred to. Iron is occasionally very useful if anæmia is present.

℞	Magnesii Sulphatis	gr. v	Syrupi Zingiberis	℥ij
	Acidi Sulphurici Diluti	℥j	Aquæ Menthæ Piperitæ	q.s. ad ℥j
	Ferri Sulphatis	gr. ¼		

M. Thrice daily after food.

℞	Ferri et Ammonii Citratis		Aquæ Menthæ Piperitæ	℥j
	Potassii Citratis	āā gr. ij		

M. Thrice daily after food.

℞	Ferri Redacti	gr. j	Sacchari Albi	q.s.

Fiat pulv. Thrice daily after food.

ften, however, this only upsets the digestion, and generally it is unnecessary, because he condition of the blood rapidly improves as the rickets pass off.

Uncombined phosphorus has been strongly recommended as a sort of specific for ickets by Jacobi and Kassowitz. Although others have found it less useful, it is certainly metimes of considerable advantage, if given with care so as not to disturb the digestion. t is usually administered dissolved in cod-liver oil, and it may be given in doses of $\frac{1}{200}$ gr. rice daily after food.

℞	Phosphori	gr. $\frac{1}{7}$	Olei Morrhuæ	℥iij

A teaspoonful thrice daily after food.

℞	Phosphori	gr. $\frac{1}{\frac{1}{4}}$	Sacchari Albi	℥iv
	Olei Amygdalæ	℥j	Aquæ Destillatæ	℥iss
	Acaciæ	℥iv		

A teaspoonful thrice daily after food.

hosphorus combined in the form of mineral phosphates has long been known to be of o value—these salts being passed unchanged in the motions.

Cold douching does a great deal of good in most cases of rickets. Salt water is to e preferred to fresh; and the douche may have a temperature of 70° to 75° to begin ith. The child should be seated in warm water at the time of its administration, and should be very rapidly and carefully given. Cold douching is specially indicated in ases where there is great muscular feebleness, and where there are any nervous symptoms facial irritability, laryngismus, tetany, convulsions). It has a strongly tonic effect on he circulatory and nervous systems. The frequent use of cold water in this way has the reat advantage that it renders the child much less susceptible to cold, and thus enables im to be more freely exposed to the open air without taking chills. Massage of the limbs, nd especially of the chest and back muscles, is of great value.

e. Symptoms and Complications.—It is always to be remembered, with regard to the ymptoms and complications of rickets, that their main treatment is that of the diathetic ondition, and that the local treatment is only of secondary importance. Thus, we find

that profuse sweatings, laryngismus and convulsions, sleeplessness and restlessness, digestive disturbances, loss of appetite, constipation, and bronchial catarrh are generally all rapidly and permanently improved when thorough antirachitic treatment is carried out, even if no special measures are taken.

It is often, however, desirable to treat special symptoms also. If the sweating is severe, it may sometimes be benefited by oxide of zinc (1 to 2 gr.). When laryngismus and convulsions recur, phenazone (1 to 2 gr. according to age) or bromide of potash may be useful; and in these cases it is generally well to use cold douching twice a day, as its effect is markedly beneficial. The ordinary treatment of digestive and respiratory disorders should, of course, not be neglected.

f. Prevention and Relief of Deformities.—We have to remember that, while rickets softens the bones and the ligaments, it does not bend and stretch them. That is done by mechanical forces acting in various directions on the softened parts. While, therefore, we are trying to arrest the rickety processes which are softening the bones, we must not forget to prevent, as far as possible, all postures and actions on the child's part which are likely to produce deformities.

The child must not be allowed to sit up for long, for fear of the development of kyphosis. If he is very rickety, he had better, at first, be kept lying on a pillow, and not allowed to sit up at all. His mother must not carry him always on one arm, lest he develop scoliosis; and any tendency to assume undesirable attitudes habitually must be checked.

Most rickety children are loath to use their limbs, and this seems to be a provision of Nature to prevent bending of the soft bones and stretching of the lax muscles and ligaments. It is generally therefore advisable to keep them off their feet, and if they are very weakly to have them lying in bed or on a pillow. It is probably advisable, however, to allow a certain amount of freedom in this matter to those whose muscles and ligaments are not much affected. It certainly improves their general health by giving them a better appetite and more interest in life. When the child has to be kept off his feet, the application of lateral wooden splints, reaching from the thigh to four inches below the sole, is very useful, because they entirely prevent his standing. No form of steel or other apparatus which permits the child to walk about is of any value in preventing the bending of the bones.

Rickety deformities of the thorax have a striking tendency to lessen as the child grows older and stronger; and this improvement can be much increased by the persevering use of musical drill, and by various other exercises of the arms and trunk. (*See also* Infant Feeding.)

John Thomson.

RINGWORM.—Ringworm may be treated from various standpoints. One may aim at the direct destruction of the fungus by the application of antiseptics, which, indeed, is the method commonly used; and the usual prolonged duration of the disease testifies to its inefficiency. But although it does not cure the disease, or at all events does not do so rapidly, it at least has the merit of preventing its spread, and one may describe first how this treatment should be carried out when once it is determined on.

The hair should be cut quite short, so that the patches may be identified. It is probably not necessary to shave the head, but if the patches are few in number it is an excellent plan to clear a little ring round each with epilating forceps. The head should be washed daily, and an antiseptic ointment applied twice a day. It does not matter much what the antiseptic is; it is the method of application which counts. Sulphur, various mercurial or copper salts, resorcin, formalin, and other preparations, all have their advocates. But the important point is that they must be thoroughly rubbed in. The mother or nurse should be instructed to spend twenty minutes over each spot, working the ointment thoroughly into the scalp with the thumbs.

The following are suitable formulæ:—

℞ Sulphuris Præcipitati		Lanolini	
Hydrargyri Ammoniati	āā ʒss	Vaselini	āā ʒss
Acidi Salicylici	gr. xx		

Fiat unguentum.

℞ Hydrargyri Oleati gr. xl | Lanolini
Acidi Salicylici gr. x | Vaselini ää ℥ss

Fiat unguentum.

℞ Cupri Oleati ℥ss | Adipis Benzoati ℥j
Lanolini ℥j

Fiat unguentum.

To be thoroughly massaged into the affected spots for at least ten minutes twice daily.

The next method of treatment is that which is often unintentionally carried out, and which may be called the indirect method, as it consists in applying to the affected part something which will produce a reaction, and thus bring about destruction or elimination of the fungus from within. The popular iodine, and the (with the patients) unpopular blistering fluid, are the more characteristic examples of this method; but many so-called antiseptic ointments really act as counter-irritants. If the disease be recent, this method is often successful, but it has the disadvantage that one is unable to follow, under the resulting scab, the progress of the affection.

The third method is that of *epilation*. Dermatologists have long recognized that this was the ideal, but the erosion of the hairs by the fungus made it impossible, even for the most skilful, to remove by the roots more than a small percentage of the diseased hairs. In the depilatory action of the *x* rays many hoped to have found a solution of the difficulty, and numerous efforts were made which at first usually resulted in the removal of the healthy surrounding hair, the diseased ones remaining in the follicles. It was left for the ingenuity of Sabouraud to point out that all that was required was a little longer exposure to the rays, and now, in skilled hands, the *x*-ray treatment is likely to take precedence of all others, since it has reduced the average duration of treatment to about one-eighth of its former length.

This is not the place to give the details of the operation. It is one which should never be undertaken by unskilled persons; indeed, of the many diseases in which *x* rays are used, it is probably the one in which experience is most essential. The disappointment when the hair does not come out, and the regrets when the reaction produced is too severe, are serious troubles to the beginner. It is impossible to lay down hard-and-fast rules applicable to all the varying mechanisms by which *x* rays are produced, and even then the factor of the tube remains probably the most important of all. As a general rule it may be said that an exposure of twenty minutes at a given distance, which varies with different tubes, should be followed, in from two to three weeks, by a complete loss of hair. The writer now always checks his exposure by the use of Sabouraud's pastilles, and has seen no reason to regret the confidence he has placed in them. If the application has not been quite long enough, the healthy hairs will fall out, and the diseased stumps remain, ready to infect the new growth when it appears some six weeks later. These stumps are loose, and much may be done by the application of a comedo extractor, or even by vigorous scrubbing, to remove them; but if they are left alone, the whole labour has been in vain, and the patient is no better off after all his trouble.

In successful cases, when the hair has fallen, antiseptics should be vigorously applied to the bald scalp. The rays have no effect on the fungus, and it is almost certain that some spores remain in the follicles. These, however, are not only empty, but open, and ointments well rubbed in have every chance of reaching and destroying the remaining spores.

When one considers the serious interference with education, and with family life, caused by the occurrence of a case of ringworm in a large family, perhaps the advice will be appreciated that it is more important to treat those children who are unaffected than the one who is. In such cases, all the boys in the family should have their hair cut weekly with clippers, and washed daily with an antiseptic soap. Such advice would probably not be favourably received in the case of the girls, but at least daily washing should be insisted upon, and the utmost rigour of separation from the infected member.

Norman Walker.

RODENT ULCER.—The treatment varies with the stage of development and extent of the disease, and also with its position. It will be convenient to consider three groups of cases.

1. In its earliest stage the rodent ulcer is a small, solid, pinkish tumour. It sometimes starts in a mole, and its commonest sites are the outer and inner canthi, the side of the nose and the alæ, and the cheek and ear. It is important that the nature of the tumour be recognized early, for it is often regarded as a wart, and allowed to develop, or, perhaps, is perfunctorily touched with caustic. If any doubt exist as to the exact nature of any wart-like tumour, especially in an elderly person, it should be treated as if it were malignant.

Complete removal with the knife gives excellent results. Care must be taken that the whole growth is excised, or recurrence is inevitable. The incisions should therefore include a margin of healthy skin. After excision, a series of short exposures to the *x* rays is useful to prevent recurrence. Even in this, the earliest stage, it may be impossible to remove the growth completely, because of its position. This is especially the case when the canthi and eyelids are affected. The removal of a small rodent growth from an eyelid is attended with great deformity ; such deformity should be avoided, if possible, not only for cosmetic reasons, but also on account of the secondary eye troubles which result from ectropion, etc. In such cases I have found the application of radium very useful. The radium salt should be spread on a flat or slightly concave surface and covered with a varnish. A radio-activity of 1,000,000 units is most serviceable. With apparatus of this strength, two or three applications of two hours' duration are usually sufficient to cure a superficial rodent ulcer. An inflammatory reaction is set up, and this may be enough to destroy the tumour. It is important to remember that the reaction set up by the radium may not appear for from fourteen to eighteen days after the sitting. As a rule an interval of four to six weeks is allowed to elapse between two applications.

Small rodent tumours which cannot be excised can also be successfully treated by paring down the growth with the knife or curette (under anæsthesia) and then applying the *x* rays in the manner described in the following paragraph. If this preliminary curetting be impracticable, the *x* rays must be used alone, but a larger dose is required.

2. The commonest stage in which advice is sought is that in which there is an ulcer with a raised beaded margin. If small, and in a suitable position, such an ulcer may be excised, together with the margin and some healthy skin, and the *x* rays applied to prevent recurrence. But if there be the slightest doubt as to the possibility of complete removal, I strongly advise that the lesion should, if possible, be treated by radium as described above. If that be impracticable, any surgical interference should be limited to paring away the margin by the knife or curette, and after a few days' interval the *x* rays should be applied. This preliminary curetting removes the mass of the growth and the intact epidermis over it ; in fact, converts the whole into an ulcer and thereby considerably shortens the ray treatment. Some cases require only two or three sittings provided sufficient doses are given. Each worker must estimate the output of *x* rays from his own apparatus. This is conveniently done by the Sabouraud pastille, originally introduced for the treatment of ringworm. Placed midway between the area under treatment and the anode of the focus tube, the pastille, which is coated with platinocyanide of barium, changes from a yellow to a particular orange colour (Tint B) when a dose of *x* rays has been given sufficient to remove the hair from the scalp without producing any erythema. The pastille must be examined without exposure to light, or it will return to its original colour. With a 15-inch coil, worked with a current of 60 volts and 7 to 8 ampères in the primary, and 1 milliampère in the secondary circuit, a spark gap of about 15 cms., a tube with a penetration corresponding to No. 7 on the Benoist scale and the area under treatment 15 cms. from the anode, I can get this result with great regularity in 12 minutes, with a dipper interrupter making 600 interruptions per minute. I find that this is a full dose for a rodent ulcer, and under ordinary circumstances an exposure of ten minutes is sufficient. Where the parts are thin and delicate, a still smaller dose is given. At the end of a fortnight there is usually a slight reaction, and when this has subsided a second dose may be required, and at the end of another fortnight a third. With smaller coils proportionately longer exposures are necessary, but with little experience it is easy to regulate the conditions to get the required result. I find it more satisfactory to give the larger doses at longer intervals, than the frequent small doses which were formerly the rule. During the application, the parts free from disease are protected with sheet lead, or the whole focus tube is enclosed in a special shield

lead glass. The shield has an aperture opposite the anode, and to the margin of this aperture are attached short lead-glass tubes of various calibres adapted to ulcers of different sizes. The advantage of this apparatus is that the part under treatment is kept at a constant distance from the anode, and also that the rest of the patient's body, and the operator, are completely protected from the rays. After each treatment, the part is covered with lint or butter muslin spread with a simple ointment, hazeline ointment being very convenient. When the healing is complete, a beautiful, soft, supple scar is left. From time to time resistant cases are met with, and the applications of the rays may have to be repeated again and again, but with the conditions above mentioned, it is rarely necessary to give sittings at shorter intervals than a fortnight.

If the edge be not removed by the curette, larger doses of *x* rays will be necessary; and when there is a massive edge with much infiltration, or if the rodent is adherent to deep structures, large doses of *x* rays, equivalent to four to six pastille doses, through

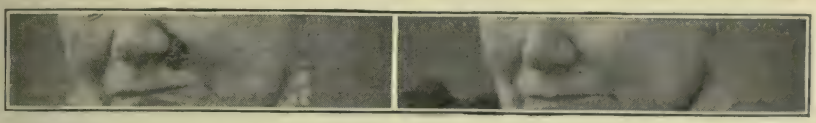


Fig. 61. Rodent ulcer of 12 years' duration. Cured by *x* rays, 1906, and well to date.

screens of aluminium from 1 to 4 mm. thick, give the best results. I usually give three of these large doses in ten days, and wait for three or four weeks before repeating them. If radium is available, applications of eight, twelve, or twenty-four hours' duration are given, the reaction from the α and superficial β rays being eliminated by interposing filters of lead.

Superficial rodent ulcers of small area also do well when treated by zinc ions. A zinc plate attached to a suitable handle is connected with the *positive* pole of a galvanic battery. It is covered with lint soaked in a 2 per cent solution of sulphate or chloride of zinc, and the lint is pressed on the part under treatment. The circuit is completed by the patient holding the negative pole in the hand. A current gradually increased to 10 milliampères is passed for five minutes at each sitting. Two applications are made a week. The process is painful, and some relief is obtained by the preliminary application of cocaine.

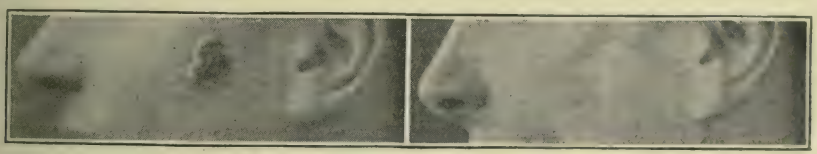


Fig. 62. Rodent ulcer of 4 years' duration. Cured by radium, 1911, and well to date.

The application of solid carbon dioxide for forty seconds to one minute is sometimes remarkably successful in the treatment of early rodent ulcer. For details of the technique see article on Carbonic Acid Snow.

3. Lastly, we meet with rodent ulcers of long duration, in which bone and cartilage have been involved and cavities opened. Here a complete cure is usually impossible, but the *x* rays are particularly valuable. Pain is relieved, ulcerated areas clean remarkably, and large cavities often fill up. Some of the most unpromising cases do remarkably well, and a combination of surgery and radiotherapy offers the best hope of cure.

Recently I have found diathermy of great assistance in some cases which were too advanced for treatment by radium.

Some of the worst cases are those in which the orbit is involved. In these, an early clearing out of the cavity is advisable. It should be followed by prolonged applications of *x* rays or radium to the indurated edges. When the cavity is foul, antiseptic lotions must be used, and I have found lysol (1 drachm to a pint of water) and a 10-volume solution of peroxide of hydrogen valuable.

Recurrence after apparent cure by *x*-ray and radium treatment is not uncommon, but in many cases it is due to insufficient dosage, and to leaving small portions of the infiltrated margin untreated. The edge is always the most resistant part, and, unless dealt with in the manner described, usually gives trouble. Up to the present I have found recurrence in 35 per cent of my cases, but many of these were of very long standing. Small recurrences are usually dealt with easily by fresh radium or *x*-ray treatment. Some patients treated by *x* rays have been quite well for eighteen years, and I have some early cases treated by radium free from recurrence for sixteen years (*see also Figs.* 61 and 62).

James H. Sequeira.

ROSACEA.—A very large number of the cases of this disease are consequent on seborrhœa of the scalp, and the treatment for that disease is followed, in such cases, by rapid improvement. (*See* SEBORRHŒA.)

Local applications hasten the disappearance of the eruption; of these, sulphur and calamine lotions (*see under* ACNE) are often useful. The glycerin so commonly added to such applications is often irritating, and may with advantage be omitted.

Although one is convinced that the relationship of indigestion to this condition is greatly exaggerated, there is no doubt that digestive disturbances do aggravate it; therefore, if these are present they should be appropriately treated.

The advantages, in this disease, of a vegetarian diet were first pointed out by Lerredde, and the writer has more than once seen great benefit result from its adoption.

In cases where there is much thickening, more active measures must be resorted to. The resorcin peeling method, which consists in the application of a 50 per cent resorcin paste, may be tried, while in those cases where hypertrophic changes lead to the disfiguring condition known as rhinophyma, or 'potato nose', surgical measures are necessary. These are, however, exceedingly simple, all that is required being the paring down of the nose to any required shape. The raw surface left skins over in a remarkably short time. Less marked cases may be treated by the application of carbonic snow. (*See also* NOSE: REDNESS OF.)

Norman Walker.

SALIVARY GLANDS, AFFECTIONS OF.

Salivation, or Ptyalism.

This most frequently results from excessive mercurialism, mercury in even minute doses owing to idiosyncrasy, sometimes producing this effect in certain cases. It is known to be produced also by drugs such as iodine, potassium iodide, antimony, jaborandi and its alkaloid pilocarpine, tobacco, physostigmine, ipecacuanha, etc.; and in other toxic conditions, such as uræmia.

The free salivation associated with certain gastro-intestinal disorders—e.g., in pyrosis or water-brash, which is associated with hyperchlorhydria, the gush of saliva being, as Langdon Brown writes, occasioned in the vain attempt to neutralize the excess of acid; and in atonic dyspepsia (hypochlorhydria), occurring in those of nervous temperament, the so-called 'idiopathic' type—should also be remembered. Salivation has been observed in pregnancy, during menstrual disturbances, and in certain abnormal conditions of the nose.

TREATMENT.—Removal of the exciting condition, drug, etc., when possible, and, in the case of mercury, a chlorate of potash mouth-wash for the spongy gums, with good nourishment, will generally effect a cure. The following prescription will be found useful:—

℞	Potassii Chloratis	gr. x	Tincturæ Myrrhæ		℥ xij
	Glycerini	ʒss	Aquæ		q.s. ad ʒj

In the idiopathic type above referred to, the appropriate treatment for hyper- or hypochlorhydria, combined with small doses of belladonna, should be tried: tincture of belladonna, 5 to 6 min., ter die, or extract of belladonna, $\frac{1}{8}$ to $\frac{1}{6}$ gr., in pill, ter die. Belladonna has also been administered with benefit intramuscularly, or by inunction. Prophylaxis should always be attempted, prior to ordering a course of mercury, by careful attention to the state of the gums and teeth, utilizing this interval to give a general tonic, preferably iron, or iron and arsenic.

Where, as may be the case after removal of one or both halves of the tongue for cancer, there is a difficulty in disposing of the saliva, routine removal of the associated submaxillary gland or glands, salivary as well as lymphatic of course, is recommended by Legg and others.

Xerostomia, or Dry-mouth.

This affection, a sudden and acute form of which is exemplified in fright, is of nervous origin in many cases, and occurs as a primary trouble chiefly in elderly women, in whom there may be also similar dryness of the conjunctiva (xerosis) and of the nasal mucous membrane, due to the xerosis bacillus, which may possibly prove to be the origin of primary xerostomia. It has also been known as the result of a rapidly progressing atrophy of the chief salivary glands, death in one case, 30 months from the onset, which occurred one month after influenza, being attributed to the consequent loss of internal secretion. Secondarily, it is a marked symptom, accompanying, and usually preceding, 'symptomatic parotitis', a fact which serves to distinguish secondary parotitis from ordinary mumps.

In non-operative gastro-intestinal disturbances, e.g., cholelithiasis, suppression of salivary secretion may precede for a considerable time the symptomatic parotitis which not infrequently supervenes.

Thirst and dryness of the mouth are always more marked after operations on the abdomen (especially on the stomach) than elsewhere. This is most noticeable where peritonitis is also present.

This condition has also been observed as a 'precocious *x*-ray reaction' a few hours after exposure to the rays, and lasting a day (*Med. Annual*, 1912).

In chronic and recurrent parotitis due to gout, in saturnine parotitis due to plumbism, at the menopause, and during menstrual disturbance, xerostomia has been observed, and a toxic origin is suggested by Tebbs.

Treatment.—The mouth should be carefully examined for carious teeth; and other sources of irritation, such as have been indicated above, should be dealt with, and tonics administered. Mouth-washes and sialagogues, such as injections of pilocarpine, have been suggested as prophylactic measures when operation is followed by xerostomia, but according to Walsham and Spencer they are not to be recommended. On the other hand, Fraser (*Edin. Hosp. Reps.*, vol. i.) recommends that the patient should hold in the mouth from time to time, for a few minutes, 5 minims of a 2 per cent solution of pilocarpine; or a ¼-gr. tabloid of the same drug may be allowed to dissolve on the tongue occasionally. Local galvanism for three months gave relief in one case recorded by Osler. (*See also below*, Secondary Parotitis.)

Primary Parotitis. (For *Epidemic Parotitis*, *see* Mumps).

Simple Parotitis is due to exposure to cold, resulting in a catarrh ascending Stenson's duct; to the presence of a calculus obstructing the duct, more frequently seen in the case of the sublingual; or to injury, in which case suppuration may occur. Bilateral parotitis has also supervened as a precocious *x*-ray reaction, five hours after a sitting, during which both cheeks had been treated (*Med. Ann.*, 1912). A very obstinate form of parotitis has been found to be due to infection of the duct by the pneumococcus, a vaccine of which organism has, in Wright's hands, yielded excellent results. To this category belongs, it is highly probable, the series of 5 cases reported by Raymond Johnson (*Lancet*, 1896), of persistent unilateral enlargement of the parotid, not of the nature of symptomatic parotitis nor of parotid bubo, and not due to enlarged lymphatic glands; the swelling being attributed by the author to swelling of the parotid from interference with escape of its secretion by inflammation of Stenson's duct; the socia parotidis in one case was affected first, and in several slighter attacks was alone affected. A similar condition in the submaxillary is also on record. Periodical swelling of one or both parotids, sometimes associated with submaxillary and sublingual gland enlargement, and lasting from several hours to two or three days, is also described (*Med. Review*, 1912). It may occur for years. As it is not due to syphilis, and does not yield to iodides, mercury, or arsenic, but supervenes on chills, it is probably due to the pneumococcus, and, if so, a vaccine should be tried. Massage over the affected gland several times a day, producing free salivation, causes rapid diminution of the swelling, though recurrences are not uncommon. To prevent these, a vaccine offers the best hope of cure. Dr. J. P. Parkinson (*Lancet*, April 10, 1915) records a case of suppurative parotitis following pneumonia in a boy, age 3 years, in which examination of the pus showed pneumococci and a few staphylococci. The abscess was incised, and healed up well without vaccine treatment.

Suppuration follows more commonly in secondary than in primary inflammation, and its occurrence is indicated by the increasing size of the gland, with redness and œdema of the skin. Owing to the density of the capsule, and the direction of the deep processes of the gland, pus tends to track towards the base of the skull, towards the mouth, and over the upper border of the superior constrictor of the pharynx.

Treatment.—The painful swelling is relieved by belladonna fomentations. If suppuration supervenes, the pus should be evacuated through a small skin incision, horizontally placed, so as to avoid fibres of the facial nerve. While some prefer Hilton's method, others advocate a freer opening of the abscess. Recently, however, puncture with a tenotomy knife and the application of Bier's suction apparatus have given excellent results, and should be resorted to the moment pus-formation is suspected, if not earlier, as a preventive method. (*See* Bier's Hyperæmic Treatment.)

Secondary Parotitis.

Secondary, or acute symptomatic, or metastatic parotitis occurs in the course of the exanthemata, typhoid fever, etc., pneumonia, and general pyæmia, during the puerperium, lesions of the alimentary canal, non-operative and post-operative; rarely, it may occur in acute articular rheumatism, when the attack is on the decline, and is unconnected with angina or stomatitis: after a temperature which may exceed 104°, resolution is complete in two to five days, under treatment with sodium salicylate in full doses (*Med. Review*, 1910). It may result from extension of inflammation to the parotid from adjacent tissues, lymphatic glands, face, and jaw, e.g., in a case of severe facial carbuncle with Ludwig's angina (*Lancet*, July 17, 1909). Very rarely, in the newly-born infant, the parotid or other glands may become infected, probably through the navel or nose (Still). To this group Tebbs applies the term *septic*, considering as *toxic* such cases as occur in connection with metabolism, gout, and plumbism, and genital auto-intoxication due to menstrual disturbances. Another group, mostly recurrent, is believed to be of vasomotor origin.

Etiology.—According to one view, symptomatic parotitis results from a dry, dirty mouth, i.e., from infection ascending up the duct from a mouth which has become septic, from becoming dry and coated with fur, e.g., during rectal feeding, etc. According to another view, the infection is generally by the blood, and is almost always the result of intra-abdominal sepsis. Ascending parotitis may also result from the toxic effects of mercury, lead, copper, iodine, or potassium iodide, etc.

Treatment.—On the first hypothesis, Bucknall emphasizes the necessity of preventing duct-infection by a thorough and constant use of mouth-washes, glycerin of borax 1 drachm to 1 oz., etc., and it can certainly do no harm. The value of this toilet of the mouth as a prophylactic measure has been absolutely denied by Tebbs, who believes that in the vast majority of cases infection is by the blood, so that only by the strictest asepsis during the operation, and by damaging the peritoneum as little as possible, is there any hope of preventing this complication. In the above case, secondary to facial carbuncle, staphylococcic vaccine and repeated doses of citric acid effected a cure. Soltau Fenwick's routine use in abdominal cases of a rubber teat or 'comforter', to promote salivation, may be tried as a prophylactic measure. A most useful mouth-wash for septic conditions of the mouth is, phenol 5 gr., glycerin 40 min., tincture of myrrh 1 min., water to 1 oz.

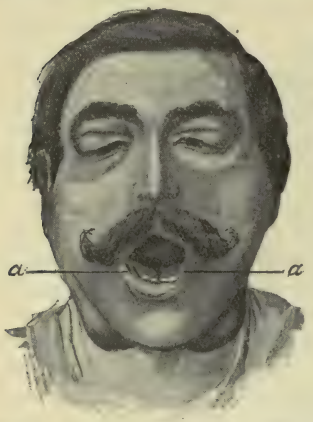


Fig. 63.—Symmetrical enlargement of the lachrymal, parotid, and submaxillary glands. (Original case of Mikulicz.) *a*, *a*, Sublingual glands.

Attention should be directed to special causes at work —gout, plumbism, etc.

Syphilis, Tuberculosis.—The fact that tubercle and syphilis may occur in the salivary glands must be borne in mind, though more often it is the corresponding lymphatic glands lying over them which are primarily affected. In the rare cases of definite luetic infection, it is stated that the parotids may become involved in both the early and the later stages of syphilis, the submaxillary and sublingual in the early stages only. The present writer, however, has seen chronic syphilitic glossitis associated with a chronic indurated swelling of the submaxillary salivary gland. Symmetrical, chronic, non-inflammatory, lymphomatous enlargement of the salivary and lachrymal glands (Mikulicz's disease) has recently been recorded, associated with syphilis (*Fig.* 63).

Treatment consists in the administration of iodides and arsenic; *x*-ray treatment has proved useful (Sejournet, quoted by Hutchison).

Actinomycosis.—Söderlund (quoted in *Med. Review*, Dec., 1913) has described isolated primary actinomycosis in two instances in a sublingual gland, in four instances in the

submaxillary gland, the glands being excised, in the absence of suppuration, in the belief that the conditions were malignant or tuberculous. He is convinced that primary actinomycosis of the salivary glands is easily overlooked, laborious examination of serial sections being sometimes necessary for its detection in what otherwise appears to be simple chronic inflammation. As such may be the primary focus from which actinomycosis enters the body, these observations have a very important practical bearing. Telford, of Manchester (*Brit. Med. Jour.*, Oct. 9, 1915), records two cases of *acute actinomycosis* of the parotid gland, which were remarkably similar in onset and symptoms, the first being caused by chewing corn whilst feeding poultry, while in the second, the patient, a week before onset, had played with some children in a field of ripe corn. Any acute cellulitis of the face of obscure origin, or unwonted appearance on incision, should excite suspicion of actinomycotic infection. The discharge or, better, a portion of tissue should be examined, and a negative result should by no means be accepted as final. The acute condition, owing to its greater rarity, is even more likely to be overlooked than *the chronic* (itself frequently missed, and diagnosed often as tuberculosis, sometimes as sarcoma), in which the course of infection is usually slow—the swelling and induration being gradual in development, without acute local or general reaction ; the subsequent softening and discharge are long-drawn-out and tedious.

Treatment.—Early recognition is most desirable, to prevent chronic as well as systemic infection, and to promote rapid cure with the minimum of facial disfigurement. Telford recommends injections at several points into the infiltrated areas with a 10 per cent solution of iodipin, to the daily amount of 10 c.c. ; the incisions and sinuses should be freely irrigated with a weak mixture of tinct. iodine and water. Internally, potassium iodide, rapidly pushed to 240 gr. a day for several weeks, and an injection of 0·3 grm. of neosalvarsan, are recommended by Telford, who secured free and dependent drainage without disfigurement as follows :—

A free incision is made above the hair line of the temple, and by blunt subcutaneous dissection a large tunnel is directed towards a small vertical incision in front of the ear, from which a drain tube is drawn towards the scalp wound. Through another incision, concealed behind the angle of the jaw, a second subcutaneous tunnel is made to reach the first, providing good dependent drainage through a second tube. (*See also* Actinomycosis.)

Salivary Calculi.—These are generally ovoid, but sometimes pear-shaped. Frequent recurrences after several calculi had been removed are recorded by G. P., *Brit. Med. Jour.*, June 15, 1918.)

Treatment.—Lockwood emphasizes the importance, both for diagnosis and treatment, of preventing the calculus slipping back along the duct, by placing one finger, or an assistant's thumb, outside the mouth, and another inside. In the case of the submaxillary, the outside finger below the angle of the jaw pushes up the gland and its duct, fixing the floor of the mouth ; the inside finger feels for the stone, steadying it against the body of the lower jaw ; the duct can then be incised, and, after extraction of the stone, is lightly plugged. In the case of a girl ten years old, Lockwood removed a calculus from the parotid duct by fixing it against the coronoid process of the lower jaw, and then with a curved knife cutting down upon it. A stenosed duct should be slit up after applying cocaine, 10 per cent, on mops ; unless the stenosis is close to the orifice, a general anæsthetic is desirable.

Excision of the Submaxillary Gland through a curved incision below the jaw is sometimes necessary, especially where exploration has involved damage to the gland substance, with risk of subsequent salivary fistula, or where pain persists, after failure to extract a calculus, or for repeated recurrence, or when the gland has become fibrotic and permanently enlarged.

Operation.—After dissecting up the flap of skin, platysma, and fascia superficial to the gland, the facial vessels at its lower and posterior pole are ligatured and divided. The submaxillary is then freed, and the facial vessels, where they pass over the jaw, just in front of the masseter muscle, are again ligatured and divided. The anterior pole of the gland, where it extends forward along Wharton's duct, is drawn out from beneath the mylohyoid muscle, and the duct ligatured before its division and the removal of the gland, to prevent infection of the wound from the mouth (Treves).

Salivary Fistula.

This is seen almost exclusively in the case of the parotid gland, resulting from a wound of Stenson's duct, or of the gland, by a stab through the cheek, or from operation, or from the ulcerating through of a salivary calculus. There is a most troublesome flow of saliva over the cheek, worse during meal-times. A considerable portion of the duct may be destroyed, and, owing also to the presence of much cicatricial tissue, treatment of such cases may be very troublesome. Stenson's duct opens into the mouth through a papilla situated in the mucous membrane opposite the crown of the second upper molar tooth. A bristle can just be passed through the orifice, the duct itself being an eighth of an inch wide, acting as a reservoir of saliva in health, and so predisposing to infection of the duct in disease (metastatic parotitis).

Treatment.—*Gland fistulæ* and *incomplete fistulæ of the duct*, P. P. Cole and R. Knox (*Lancet*, June 7, 1919) state, never fail to respond to radiation—*x* rays or radium.

Treatment of *complete fistula of the duct* consists in re-establishing a channel from fistula to mouth so that it becomes easier for the saliva to escape by the mouth than by the fistula. The following methods are recommended :—

The finest of drainage tubes, threaded with silk at both ends, is attached to the eye of a probe, the fine point of which is insinuated into the mouth of Stenson's duct, and brought out on to the cheek, leaving the tube in the duct. The silk threads are tied over the cheek ; after four days they are untied, the tube is dragged some way on to the cheek, and about ¼ inch is removed from the outer end. To the outer end of what remains a fresh thread is attached, and the tube dragged back into place, thread, however, now replacing in the track the removed portion of tube. In the same way, at intervals of four days, the rest of the tube is gradually shortened, until, by the time it has been completely removed, leaking from the fistula has almost ceased. If there is recurrence of leaking, the procedure is repeated.

The present writer has improved on this method by dragging the tube across from the distal into the proximal portion of the duct, thus establishing direct continuity and correct alinement of these two portions. It is quite easy to insert a fairly large ophthalmic probe through the fistulous opening on the cheek into the proximal portion of the duct. The opening in the duct itself naturally lies in the floor of the fistulous opening, its depth from the surface varying. In the cases recorded by Mr. Cole, referred to below, there was a slit in the outer wall of the duct proximal to the stenosed end, this slit being the remains of either the original wound or of the lumen of the completely divided duct, kept open by the constant flow of saliva. In other cases, as the present writer has observed, the completely divided end of the proximal portion of the duct, as the result of scarring, is directed outwards, so as to lie sometimes immediately beneath the orifice in the skin, and a probe can be at once passed obliquely inwards and backwards along the duct. Persistence of the fistula is due to this displacement outward of the cut end of the completely divided duct, and the procedure now recommended is directed to restoring continuity of the divided ends.

Leaving the probe *in situ*, or re-introducing it later, the finest drainage tube, threaded at both ends with 'black ophthalmic D' fishing-gut, is inserted into Stenson's duct from the mouth, and its outer end dragged on to the cheek in the manner already described. A non-cutting round intestinal needle is now threaded on to the suture attached to the outer end of the tube, and, removing the probe left in the proximal end of the duct, the needle is carefully introduced into the duct for about 1 to 1½ inches, and its point then made to puncture the duct and emerge through the cheek, dragging with it the suture. The tube is thus brought across from the distal to the proximal portion of the duct, and the divided ends are placed in continuity. The suture is fastened by a loop around the ear, and to the loop is attached the other suture, fixed to the inner end of the tube and brought out of the mouth. A collodion dressing, repeated daily, seals the fistulous opening and seems decidedly to facilitate healing.

The inner or oral end of the tube is dragged down and shortened by about ¼ inch every fourth day, until it has been completely cut away. The suture may be allowed to remain for a few days longer, if leaking persists ; or the entire procedure may be repeated. For two cases, in one of which there were two fistulæ, thus cured by the writer, see *Lancet*, June 25, 1920.

Should this method, after one or more trials, fail, where most of the duct remains intact, the portion proximal to the fistula is freed, and brought into the mouth through an opening at the level of the anterior border of the masseter.

Acting on the principle that "if the duct will not meet the mouth cavity, the mouth cavity must be made to meet the duct," P. P. Cole (*Lancet*, June 7, 1919, and *Med. Annual*, 1920, both articles illustrated) records two successful cases in which he has modified this operation by leading the freed duct through the slit-up apex of a pouch of buccal mucous membrane, caused to bulge into the wound which has been made by a slightly curved, generally-horizontal, skin incision through the cheek; the pouch, when slit, being sutured to the deep structures of the cheek, and the resected end of the duct then anchored to the mucous membrane within the mouth.

For the severer type of case, where there is much cicatricial tissue and most of the duct is destroyed, Dejardin and Gulikers' plan is to free the portion of the parotid lying over the masseter, through an incision made in the direction of the remnant of the duct. The gland and its duct are tucked in between the masseter and the ascending ramus of the jaw, and the duct is brought through the buccal mucous membrane and there sutured. (*Med. Annual*, 1902.)

Tumours of the Salivary Glands.—These are either *innocent* or *malignant*, and this prime distinction is often the only one possible, as it is certainly the only one of importance prior to operation. Of the innocent variety, many formerly described as 'mixed tumours' are now considered to be endotheliomata, and occur in connection with both the parotid and the submaxillary glands, forming an additional reason for their early removal.

Treatment.—A benign growth, freely movable beneath the skin and over the deep structures, should be excised, lest malignancy supervene, apart from which, delay only increases the difficulty of operation, especially in the case of the parotid—which, besides the detached portion lying upon the masseter above Stenson's duct, called the socia parotidis, has several deep-lying processes passing inwards towards the pharynx and tonsil, and downwards towards the neck.

In operations on this gland, the important point is the preservation of the facial nerve, which enters at the posterior limit of the parotid and breaks up into its two main branches. These radiate forwards, upwards, and downwards, in a more or less horizontal direction, both within and superficial to the dense capsule of the gland derived from the deep cervical fascia. Branches of the facial nerve, though generally lying deep to a benign tumour, may pass superficially, and to avoid them, by bringing them clearly into view, an extensive horizontal skin incision over the swelling has been recommended. This is carefully deepened, retracting such nerve fibres as are seen, until the capsule, by blunt dissection, has been reached and incised, when the tumour can usually be shelled out without difficulty. In operating, it is essential to keep close to the capsule, to keep the wound mopped dry, and to work very cautiously and gently to avoid damaging nerve fibres. Carwardine (*Lancet*, 1907) excised the parotid successfully, first dissecting out the facial nerve ramifications and holding them aside in a loop of catgut. The temporary facial paralysis disappeared after some months.

A vertical skin incision is far less unsightly than the horizontal, and minimizes injury to the temporal vessels and nerves ascending in front of the tragus of the ear. The edges of the wound are then held aside, and the tumour is exposed by a horizontal incision through the fat, etc. Legg recommends, for a large benign parotid tumour, an incision along the posterior edge, curving forward along its lower margin, turning forward a flap of skin and subcutaneous tissue, avoiding such branches of the facial nerve as may be met with, and then exposing the capsule of the tumour. In the present writer's experience, this is the best incision, and it gives an excellent cosmetic result.

Cheyne and Burghard recommend a curved incision along the anterior border of the sternomastoid, from the mastoid process downwards, and then forwards, and finally curving up across the ascending ramus of the jaw.

In the case of the submaxillary gland, the growth is exposed through a curved incision below the body of the lower jaw. (*See under* Excision of the Submaxillary Gland, *ante*.)

Lengthy treatment with radium, at intervals of four to six weeks, with an exposure of thirty hours' duration extended over forty-five days, is credited with improving and apparently curing parotid tumours (*Report of the Radium Institute*, 1912); but in view of the endotheliomatous origin of many benign tumours, and their tendency to become definitely malignant, early removal is the safer course to advise.

In the case of malignant tumours—if operable—the entire gland must be excised, sacrificing the facial nerve. Temporary or permanent ligature of the external carotid artery is generally necessary. For details, surgical text-books must be consulted.

Wounds of the Parotid Gland are serious, often resulting in a salivary fistula if the duct is divided (for the treatment of which see under SALIVARY FISTULA, *ante*), or involving damage to the facial nerve branches, or venous or arterial hæmorrhage, in checking which nerve branches may be injured. It is essential to keep the wound dry, to see clearly the bleeding point, so as not to include a nerve in the ligature. If the vessel cannot be defined, it is recommended to plug the wound in venous hæmorrhage; and in arterial bleeding, after preliminary plugging, to expose, and apply a temporary ligature to, the external carotid artery near its origin. If, on now removing the plug the bleeding point is detected, it should also be ligatured, in view of the collateral circulation. The wound may then be closed, plugged, or allowed to granulate up, according to circumstances.

Henry Curtis.

SALPINGO-OOPHORITIS.—In the majority of cases of salpingo-oöphoritis, or inflamed appendages, no operation is necessary. During the acute stage the treatment consists in absolute rest in bed, administration of laxatives, fomentations or turpentine stupes to the abdomen, and hot douching if it gives relief to pain. When the condition has reached a chronic stage, counter-irritation to one or both sides of the lower abdomen is useful, e.g., painting with equal parts of tinct. iodi mitis and tinct. iodi fortis, or application of a blister.

If there is strong evidence that one of the Fallopian tubes contains pus, an operation should be performed, if possible after the acute stage is over, as the pus becomes less virulent after a lapse of time. Apart from evidence of the presence of a pyosalpinx, removal of an inflamed tube or ovary and tube may have to be advised on account of pain, impairment of general health, and recurrence of attacks of pelvic peritonitis. No minor uterine operation should be carried out during an attack of salpingo-oöphoritis: curetting in such circumstances may be followed by a severe pelvic peritonitis.

It must be noted that the ovaries are blameless in many cases of so-called 'chronic ovarian pain'. Neurasthenia, anæmia, constipation, and dyspepsia are common causes of this complaint. Attention to the general health, especially to the state of the bowels, with entire avoidance of local treatment, will often effect a cure. Nothing can be worse treatment in such a case than to tell the patient that her ovaries are responsible for her pain, and to direct her attention to the condition of her genital organs. If there is any local condition that really requires treatment, it should be treated, and the patient should be told that its bad effects begin and end in leucorrhœa, backache, etc., and that it is not responsible for her general condition; but unnecessary 'tinkering', such as repeated cauterization of the cervix, insertion of tampons, etc., in a neurotic patient, and giving her detailed information as to the size, shape, and position of her uterus and ovaries, may do her an incalculable amount of harm.

H. Russell Andrews.

SCABIES.—By far the best treatment for this disease is the old-fashioned one of sulphur ointment. But it is not enough to apply it in a perfunctory manner, twice daily. In the severe cases, such as one meets in hospital practice, it is generally necessary to keep the patient freely anointed with the ointment, day and night for three days, while special attention should be paid to the hands, by which the disease is spread. The more rapid if somewhat cruel method in use in some foreign hospitals, of soaking the patient in a hot sulphur bath, then scrubbing him vigorously with soft soap and a nail brush, and allowing him to soak for a further hour in the bath, and then rubbing sulphur ointment freely in, is perhaps worthy the attention of municipal authorities; for scabies takes a heavy toll annually from the efficiency of the navvy class.

In the more cleanly classes, while the same treatment may be resorted to, milder methods are often sufficient. The writer cannot speak so highly as some do of Peru balsam, and prefers to recommend in such cases the use of sulphur soaps, the lather of which may be diligently rubbed in night and morning to the axillæ and other parts where the disease is found in the cleanly.

It may be worth while also to adopt Sherwell's plan of dusting the bed with flowers of sulphur; he says it is the most efficient of all methods.

In children, the pustular lesions are often so tender looking as to dissuade the young practitioner from so irritating a remedy as sulphur, and in such cases β-naphthol, from 5 to 10 per cent in ointment, may be used instead. *Norman Walker.*

SCALDS.—(*See* BURNS AND SCALDS.)

SCALP, CONTUSIONS OF.—These injuries differ in some respects from similar injuries in other parts of the body, and so need special mention. The receipt of a blow on the head is frequently followed by considerable extravasation of blood. This extravasation may be in one of three positions :—

1. *Subcutaneous*, in which case the tough subcutaneous tissue of the part prevents the effusion from becoming of great extent.

2. *Subaponeurotic* : the extravasation is in this case only limited in extent by the attachment of the epicranial aponeurosis, in front to the supraciliary ridges, laterally to the zygoma and mastoid process, and behind to the superior curved line of the occipital bone.

3. *Subpericranial* : the effusion of blood being limited by the attachment of the pericranium to the suture lines, the resulting hæmatoma assumes the form of one of the cranial bones.

A swelling occurring in any one of these three situations has characteristics which must be carefully noted. The central part of the swelling is soft and compressible, whilst the edge is hard and raised. The greatest care is called for to avoid mistaking this hard ridge for bone, and the central soft part for a depression of the vault. If firm pressure be made upon the hard ridge for a short time it is felt to disappear, and the smooth bone beneath is felt at its normal level ; moreover, similar pressure upon the soft centre will reveal the surface of the vault smooth and regular, not irregular and guttered as it would be in the case of a depressed fracture.

TREATMENT.—It is well to quote at the outset the saying of Hippocrates, 'Nullum capitis vulnus contemnendum'. If there have been signs of concussion, or if there be any suspicion of intracranial lesion, it is the duty of the surgeon to insist upon the precautionary measures in the way of rest, etc., which are detailed under the head of BRAIN, CONCUSSION OF. The careful cleansing of any abrasion, and the application of evaporating lotions, are all that is necessary in direct treatment for the hæmatoma. Should suppuration ensue, the swelling should be incised immediately, the breaking-down clot turned out, and a drainage tube inserted in such a position as will ensure efficient drainage with the patient lying down. *S. Maynard Smith.*

SCALP WOUNDS.—The subcutaneous tissue of the scalp is closely bound to the subjacent aponeurosis ; the aponeurosis, on the other hand, is but slightly connected with the pericranium over the bone beneath. It therefore follows that a superficial scalp wound will gape but little, whilst one which involves the aponeurosis will lie widely open. Again, the blood-vessels enter at the margins of the aponeurotic attachment. No vessels of appreciable size cross the subaponeurotic space to enter the flap. Consequently, all the bleeding from a torn-up flap of scalp comes from the torn edge ; there is none from the under aspect of the flap. For the same reason there is no danger of a flap sloughing so long as it has a marginal attachment, since the source of its blood-supply is uninjured.

TREATMENT.—The arrest of hæmorrhage sometimes gives rise to trouble. The vessels at the margin of the flap may be caught with artery or Spencer Wells' forceps, and tied with fine silk or catgut. If the deep temporal arteries be divided, it may be necessary to enlarge the wound to secure them. The chief essential in the treatment is to carry out thorough and careful purification of the wound and its neighbourhood : in the case of a large wound an anæsthetic should be given to facilitate this. The wound is protected by a piece of gauze wrung out of antiseptic lotion (carbolic 1–40 or perchloride 1–2000). The surrounding skin is then shaved ; this may, in the case of extensive wounds, involve the shaving of the whole or nearly the whole scalp. The skin is next scrubbed with soap and water, and finally cleansed with an antiseptic lotion. The gauze is now removed from the wound, and the cavity and edges of this are carefully treated with the same lotion, great care being taken to remove all hair and foreign substances. The iodine

method is not suitable owing to the difficulty of dry shaving the scalp, whilst if soap and water be employed for shaving, the efficacy of the iodine is greatly impaired. If the wound be badly soiled or the skin edges much damaged, it is better to excise the whole wound *en masse*. Healthy clean-cut edges are thus left for suture. The wound is closed with silkworm gut, but, if it be at all extensive, a small rubber drainage tube, which has been boiled, should be inserted in the lower angle of the wound. A dressing is applied, and if all goes well the drainage tube is removed after twenty-four hours, and the stitches at the end of a week. If suppuration ensue, several of the sutures are removed, and drainage tubes inserted at two or three points along the wound; and if difficulty be experienced in securing free exit for discharge, a counter-opening is made through the most dependent part of the attached margin of the flap, and a drainage tube inserted there. Boracic fomentations are then applied, and changed every four hours.

S. Maynard Smith.

SCARLET FEVER.

The Malignant or Toxic Form.—The patient must be kept strictly in the recumbent position; hypodermic injections of strychnine should be given every two to four hours, and brandy or champagne by the mouth; if the temperature be high, the patient should be wet-packed, or sponged with cold or tepid water. There is usually too much prostration to permit baths. If there be vomiting, the milk should be peptonized or nourishment given by enemata.

The Anginous or Septic Form.—The pyrexia, sleeplessness, and delirium are best treated with sponging, packs, or baths.

The local faucial lesion (inflammation followed by sloughing and ulceration) requires antiseptic treatment. In mild cases, gargling or spraying will be sufficient, but in severe cases the fauces and nasal passages should be flushed out with a Higginson's or a bal syringe, or with a douching apparatus. A sheet or large towel should be fastened round the child so as to restrain the arms. The patient's head should be held under the nurse's left arm over a basin; with the right hand the nurse uses the syringe. Two persons may be required for strong children, if they resist, as they are very likely to do when delirious. The following solutions may be used: chlorine water (to make this, 4 drachms of chlorate of potash are put into a large dry bottle and 1½ drachms of pure hydrochloric acid are added; chlorine gas is given off; when the gas ceases to evolve, add 30 oz. of water a few ounces at a time, shaking the bottle each time water is added: the gas is dissolved in the water: 1 oz. of syrup should be added to every 5 oz. of the solution, just before use); permanganate of potash, 15 gr. to the ounce; a saturated solution of boracic acid; chinosol, 1–600 to 1–1000; the alkaline lotion mentioned in the article on DIPHTHERIA. In very foul cases the following solution may be used as a spray:—

℞				
	Tinturæ Iodi Fortis	♏xl	Glycerini	℥iv
	Acidi Carbolici Liquefacti Puri	℥ij	Aquæ Destillatæ	q.s. ad ℥viij
	Spiritus Rectificati	℥ss		

Later, when the swelling has subsided and the exudation or secretion is less abundant, the ulcerated surface should be swabbed with carbolic lotion 1–40, or 1–1000 perchloride of mercury. Gargling, flushing, spraying, and swabbing should be done as often as the case requires, from three times a day to every three or four hours. The pain in the throat may be allayed by the application of hot fomentations, and letting the patient suck ice. A 5 per cent solution of cocaine also may be occasionally applied.

For **Cervical Cellulitis** the writer does not recommend early incision. The treatment he adopts is fomentation with warm boracic lotion till the skin is beginning to give way; then the skin is slit up, the underlying slough removed, and the wound treated aseptically.

If the ulcerative process spreads from the fauces to the *larynx*, the patient should be put in a steam tent; and, if severe dyspnœa supervene, submitted to tracheotomy. Intubation is harmful in this condition.

Otitis Media.—Occasionally earache is the first sign; this may be relieved by the instillation of a drop or two of warm laudanum or cocaine solution, and the application of hot fomentations over the whole ear. If these measures do not relieve, a leech over the upper part of the mastoid process will often succeed. If the tympanic membrane

is bulging, it should be punctured. There is nothing special about the treatment of the ear discharge that usually follows upon the earache (*see* EAR, AFFECTIONS OF).

Rhinorrhœa should be treated by syringing the nasal passages with one of the solutions already mentioned. It is also important to prevent the child from picking his nostrils, and so setting up a very intractable and infectious ulceration. Cardboard splints on the arms are the best means.

Nephritis.—It is quite unnecessary to keep the convalescent scarlet-fever patient in bed in the hope of averting nephritis. Whether the patient be getting up or not, the urine should be examined at least every other day, and also upon the occurrence of any other complication, such as adenitis, otitis, or secondary tonsillitis; if albumin is found, the patient should be ordered back to bed at once, and put upon a milk diet. Three or four days will usually show whether the albuminuria is a symptom of nephritis or not. Usually, nephritis begins suddenly with hæmaturia. The patient should be kept on milk, not only till blood has ceased to appear in the urine, but also until the albumin has much diminished. He may then be allowed, in due course, fish, chicken, and, finally, meat diet. It is a mistake to keep nephritis cases, in which the acute symptoms have subsided, too long on a milk diet and in bed. When the diet is increased, they may be allowed to sit up in blankets or a dressing-gown, and later, even before the albumin has quite disappeared to get up in clothes, and, in warm weather, walk out of doors.

Linseed-meal poultices should be applied to the loins every three or four hours. Perspiration may be encouraged by hot-air baths hot packs, or baths once or twice a day. The bath should be brought to the bedside. The bowels should be kept freely open by castor oil or salts.

Convulsions may usually be cut short by the inhalation of chloroform.

Coma (fortunately not common apart from convulsions, when it passes off soon after the convulsions cease) should be treated by dry-cupping the loins and giving hot packs. If these remedies fail, a few ounces of blood may be abstracted by venesection or the application of leeches to the loins.

Nephritis cases usually become anæmic, and during convalescence will require iron. Perhaps the best form is the alginoid, in 5- to 15-gr. doses.

Rheumatism.—Salicylate of soda or acetylsalicylic acid will, as a rule, relieve the articular pain and swelling very quickly. The affected joints should be wrapped in wool, and the patient be put on a milk diet.

No special treatment is required for the remaining complications of this disease.

A word or two must be said concerning the use of serums and vaccines. In severe cases of scarlatina anginosa it is worth while trying a polyvalent antistreptococcic serum in doses of 20 to 50 c.c. I have seen several cases in which much benefit has followed. On the other hand, in many cases the treatment has been of no avail.

Opinion as to the worth of vaccines varies widely. Personally, I have not seen any benefit result in the few cases in which a vaccine has been given during the acute stage of the attack, and little, if any, in such complications as persistent rhinorrhœa and otorrhœa. But other observers have reported favourable results, both in the disease itself and the complications mentioned. For the former, the dose is five to twenty million cocci, followed by double the amount in three or four days; an autogenous vaccine should be used unless the case is very urgent, when a stock vaccine made from a large number of different strains of cocci should be employed. In chronic otorrhœa and rhinorrhœa, an autogenous vaccine should be prepared. In no cases should local treatment be omitted.

With regard to the *general treatment*, the reader is referred to FEVERS, ACUTE INFECTIOUS. The patient may be allowed to sit up in a dressing-gown as soon as the temperature has been normal for six or seven days, provided there is no severe complication. In another five or six days he may be allowed to walk about in clothes. A very large number of the patients in the Metropolitan Asylums Board's Hospitals are transferred to the convalescent hospital in the country at the end of two to three weeks' stay in the town hospital, and they derive much benefit from the early change.

With respect to the period when the patient is to be considered free from infection, for some time past the writer has been discharging patients from the hospital at the end

of four weeks' stay therein, quite irrespective of the desquamation; some of the patients have finished peeling by that time, others are still peeling vigorously. These patients however, do not appear to be infectious. But if there is any discharge from the nose or ear, the patient should not be dismissed so early. It is also desirable that patients who have recovered from scarlet fever should be kept away from other susceptible children for at least a fortnight after their return home.

Quarantine period: one week. *E. W. Goodall*

SCARS.

Simple Skin Scars.—Cicatrix or scar is a connective-tissue new-formation replacing loss of other tissue, and is of a soft or firm, whitish or reddish appearance. Scars are usually considered as permanent conditions, except those of a very superficial nature which after some years may more or less disappear. On the other hand, some scars tend to become more prominent or hypertrophic as years go on.

Much may, however, now be done in causing absorption of scar tissue, and almost wonders can be achieved in improving the appearance of the same. Many scars, as for instance those the result of tuberculous glands in the neck, are very conspicuous and unsightly on account of their depression, irregularity, and adhesion to the deeper structures. By the application of Bier's suction glasses daily, the scar can be gradually drawn to the surface of the skin, and in this way become much less conspicuous. At the same time, the repeated hyperæmia produces an increased vascularity in the part, improves the nutrition, and tends to convert what was a non-vascular tissue into a vascular one. All this time the tendency will be to the replacement of the bloodless fibrous tissue by a more normal vascular one. So not only will the cicatrix be drawn or sucked up on a level with the surrounding skin, but its vascularity will be increased, and so its colour contrast with the neighbouring skin rendered less marked.

This hyperæmic treatment may be assisted by the injection at the same time of fibrolysin (thiosinamine) every three or four days into some part of the body, usually removed from the region of the scar. Undoubtedly, in many cases this drug has the property of assisting in the absorption of the scar tissue, and sometimes to a very remarkable extent. Thiosinamine solutions may also be cataphoresed directly into the scar tissue itself.

The surface of scar tissue can be readily smoothed down by bassorins of resorcin of 30 per cent or stronger, as follows: Tragacanth 5 parts, glycerin 2 parts, water 93 parts, add resorcin to 30 per cent. This should be applied daily and left in contact with the scar till sufficient desquamation has occurred, after which sedative preparations must be put on until all the inflammatory process has subsided. The best are in the form of lotion such as the calamine lotion:—

℞ Calaminæ		Mucilaginis Tragacanthæ	℥ss
Zinci Oxidi	āā ℥ss	Aquam Rosæ	ad ℥j
Tincturæ Benzoini Simplicis	ℿiij		

Small repeated doses of the *x* rays, usually filtered and very cautiously applied, also assist in the same process, but the results must be carefully watched for the appearance of telangiectases, which are rather liable to occur, especially in scar tissue, even many months after the treatments have been stopped. These, if they should arise, can be obliterated by the negative electrolysis needle. Radium is also an absorbent of scar tissue, and has produced some very good results.

Ionization is often a very satisfactory method of treatment for the obliteration of scars on the surface of the body. Chloride of sodium is an absorbent of scar tissue, when used in a 2 per cent solution and applied by the process of anaphoresis—i.e., the negative pole of the constant current being applied to the region of the scar, and the inactive or positive pole applied to some other region of the body. For instance, in treating scars about the face by this method, a well-padded metal electrode is chosen, about the size and shape of the lesion to be dealt with, and some half a dozen layers of lint dipped in a 2 per cent solution of chloride of sodium, carefully applied over the electrode to prevent the metal from coming in contact with the skin, and this electrode is attached to the negative pole of the current. One of the patient's hands (with all rings, etc., removed) is then placed in a beaker of tap-water, and into this is put the positive electrode. The electric current is then turned on, and very gradually increased up to about 1 ma. per

quare centimetre of surface of the active electrode, varying according to the susceptibility f the patient, and the treatment is continued for some ten to twenty minutes, care being aken to keep the pad soaked in sodium chloride solution quite wet all the time. After he treatment the area will be somewhat reddened, but this will subside in a few hours. A little sedative lotion, such as the calamine one, may be applied, or some calamine cream uch as :—

℞ Calaminæ		Olei Lini	ʒj
Zinci Oxidi	āā gr. xv	Lanolinum	ad ʒj
Olei Lavandulæ	℥v		

The treatment may be repeated every three or four days, or as soon as the hyperæmia rom the previous one has subsided.

Adhesions.—The treatment of adhesions due to the formation of scar tissue in the eighbourhood of the large joints, the result of traumatism such as fracture, dislocation, nflammation, or wounds from bullets, shrapnel, etc., opens a large field for the various ethods of physical therapeutics. Many of these cases are accompanied by much pain, specially on movement, and it is to relieve these symptoms that treatment is first directed.

Local applications of heat, either dry or moist, will usually give rapid relief. The ormer may best be obtained by means of diathermy, which can be very conveniently pplied to adhesions about the wrists, ankles, elbows, or knees, an electrode being applied bove and below the seat of the lesion ; the current being turned on, the narrowest part etween the electrodes becomes the warmest. For the shoulder or hip, dry heat is best pplied by a local radiant-heat apparatus (Dowsing's), which consists of electric-light lamps rranged in metallic reflectors. These can be adjusted to radiate on to the affected part. 'he hot-air douche, also worked by electricity, is very useful, and can be directed on to ny local area.

Ionization also offers a practical method of treatment for the absorption of adhesions, hen not too extensive or too deeply seated. For adhesions about the fingers, hands, r feet, the part to be treated should be placed in a receptacle containing the solution to e used, such as sodium chloride, sodium salicylate, iodine, etc., into which the negative ectrode is placed, the opposite limb being immersed in another one containing water nd the positive electrode.

Simple galvanism, with a roller positive-active electrode, is useful, not only for the lief of pain, but for the stimulation of the surrounding muscles, which are often wasted rough disuse. High frequency, applied in the form of effluve or with the vacuum ectrode, is an effective adjunct.

With whatever method, gentle passive movements accompanied by appropriate assage will add to the efficiency of the treatment.

Painful Scars.—For painful scars, salicylate of sodium may be used in place of the loride of sodium, and applied in the same way ; and this method, especially if combined ith applications by the hot-air douche, will be very sedative and comforting.

In much the same way local radiant-heat applications, followed by gentle massage, ill often greatly assist the improvement of scar tissue.

Diathermy is also a modern method for the treatment of various forms of scars. It especially useful in those cases accompanied by a certain amount of pain, as the passage f the diathermy current causes hyperæmic changes in the tissues which are of great value promoting absorption of inflammatory products, improving local nutrition of the parts, nd resulting in relief of pain with an accompanying sedative effect. This treatment is enerally indicated in cases of various forms of adhesions due to fibrous scar tissue.

Scar Formation Associated with Ulceration.—These cases, especially if of a septic ature, will be much better by exposure to the ultra-violet rays, for, in addition to the ntiseptic action of these rays, the hyperæmia produced in the superficial structures will e beneficial and stimulating in its effects.

Scars resulting from Acne, Small-pox, Chicken-pox, etc.—Daily the dermatologist called upon to relieve the unsightly scars resulting from old-standng acne on the face, nd he has to decide which of the numerous treatments should be recommended.

It is frequently desirable to employ several methods to each individual case, either gether, or first one and then another, for varying periods according to the condition of

the lesions. For instance, in most cases small repeated applications of *x* rays, about a third of a pastille dose, filtered through a layer of felt or chamois leather, are the best method to commence with. This must not be attempted in the case of brunettes or of women with a tendency to excessive growth of hair on the face, as in the former pigmentation is easily produced, and in the latter an increase of the hirsuties is probable. So, also, the treatments must in no case be too frequent or too many in number. In the intervals between the applications, Bier's suction cups can be applied to those areas where there is much depression or infiltration of the scars, when steaming and massage are also very useful.

After or between the *x*-ray applications, ionization with sodium chloride solution can be used every two or three days—a pad well soaked in the solution being applied over a negative electrode to the areas of infiltration. If there is extensive hypertrophic scarring over a considerable area, we may use a large piece of lint folded in several layers and well soaked in the solution and covered by a metal fabric—e.g., a 'segic' pot cleaner, which is very practical for the purpose—and the whole firmly attached by a bandage; hooks from the negative electrode are applied to the metal, one of the hands being at the same time inserted into a beaker or basin of water containing the positive electrode. By this method extensive areas of skin can be treated at the same time.

In some very severe cases it may be desirable to produce a desquamation of the superficial layers by the application of bassorin of resorcin, according to the prescription given in the earlier part of this article.

These same treatments may be used for the removal and improvement of scars resulting from small-pox, chicken-pox, and the like. (*See also* KELOID.)

W. Knowsley Sibley

SCIATICA.—Sciatica may be, and frequently is, only a symptom of disease situated in the spinal cord, the bodies of the vertebra, the pelvis, or the hips. Disease of the rectum and new growth, may give rise to pain in the course of the sciatic nerve. Constipation is also a frequent cause of sciatica, and is said to explain the greater frequency of the affection in the left leg. Exposure to wet or cold, or the pressure of a hard seat, may under certain conditions induce an attack. It is especially liable to occur in gouty individuals and in those who pass uric acid in the urine. It also occurs in connection with rheumatism, gonorrhœa, and oral sepsis.

It is obvious, then, that successful treatment depends to a large extent on accurate diagnosis: but although a certain number of cases come under observation which may be due to the causes above indicated, a far larger number occur in which no very obvious cause can be demonstrated.

Treatment may be dealt with under the following heads: (1) Rest; (2) Application of heat; (3) Electricity; (4) Local applications; (5) Massage; (6) Diet; (7) Drugs; (8) Injections; (9) Change of climate; (10) Surgical treatment.

1. **Rest.**—In most cases rest in bed is advisable, and in acute cases essential. Complete rest to the affected limb is best secured by the use of a long splint. The limb should previously be carefully bound up with a flannel bandage applied from the foot to the groin, the knee being slightly flexed, but the hip kept extended and the heel supported. After three or four days the bandage should be reapplied daily, the joint angles altered slightly, and, as the pain begins to pass off, gentle passive movements should be carried out. Later on the bandage alone may be used by day and the splint at night. Points of persistent tenderness should be counter-irritated, and massage used as soon as it can be borne. In very severe cases it may be necessary to give an injection of morphia for a few nights to enable the patient to tolerate the splint. The patient should not be allowed to sit for a week after leaving bed. When a splint is not employed, the limb should be supported by pillows, and movement limited by the use of sand-bags.

2. **Application of Heat.**—This is of special value in the relief of pain. During the early stages of a mild attack, a Turkish bath undoubtedly gives good results.

Hot-air baths, applied locally, are also most beneficial, and a temperature of 300–400° F. can be made use of when suitable precautions are taken.

Such local heat may be obtained in a closed chamber heated by gas or a spirit lamp, or still more easily by the electric current. Both methods are somewhat expensive in application, and much good may be done by hot sand-bags, which can be heated in a

ordinary oven and applied along the course of the sciatic nerve. Another simple and effectual method of applying heat is by means of a hot iron, the patient being ironed along the course of the sciatic nerve. A hot-water bottle may also be used. The local hot-air bath should be applied at first every other day, and, since it gives rise to a considerable amount of sweating, the patient should be carefully protected both during and after its application. The local application of heat is also available in cases in which for general reasons it is inadvisable to sanction a Turkish bath.

A simple hot bath, to which an alkaline salt or ammonia has been added, is often beneficial.

3. **Electricity.**—Galvanism often gives satisfactory results. Static electricity and diathermy have been used in some most obstinate cases with striking effect; faradism and high frequency have also been used.

The galvanic current may be applied by means of a bath—the direction of the current being immaterial—or direct application may be made to the skin, the positive pole being placed on the thigh and the negative pole on the back. A current of 2 milliampères is gradually increased to 5 milliampères. This is allowed to pass for 5 to 10 minutes, the current then being gradually reduced and the electrodes removed when the current has been shut off. Ionic medication (kataphoresis) with iodine, sodium salicylate, etc., is of value in many cases (for details as to the method of application reference should be made to the article on ELECTROTHERAPEUTICS, *Ionic medication*, p. 277).

4. **Local Application.**—Blisters along the back of the thigh are sometimes successful in the relief of pain, two or three days being allowed to elapse between the application of each blister. Counter-irritation may be made by the actual cautery. The local application of belladonna, mesotan, turpentine, and iodine is also useful. In order to avoid pressure on the nerve, it is advisable for the patient to have an air cushion when seated for any length of time.

5. **Massage.**—Massage and passive movements are of service in the late stages of the disease, but should not be allowed during the acute stage.

6. **Diet.**—A restricted diet, such as is suitable in a case of gout or rheumatism, should be ordered. Alcoholic drinks should be avoided, but whisky may be ordered if necessary.

7. **Drugs.**—Drugs in some cases have a markedly beneficial effect, but in other cases seem almost useless. Quinine, iodides, bromides, salicylates, salicin, belladonna, sodium and potassium bicarbonate, colchicum, gelsemium, acetylsalicylic acid, acetanilide, phenazone, and many others, have been used with good effect.

Quinine and iodine may be given together in the following mixture, three or four times a day:—

℞	Quininæ Sulphatis	gr. j	Acidi Sulphurici Diluti		♏j
	Potassii Iodidi	gr. iij	Aquæ Chloroformi		℥ss

The small quantity of acid is sufficient to keep the quinine in solution, and not incompatible with the iodide.

The following mixture will also be found of some service:—

℞	Sodii Salicylatis	gr. x	Tincturæ Cardamomi Co.		℥ss
	Tincturæ Gelsemii	♏x	Aquæ Chloroformi	q.s. ad	℥ss

The quantity of gelsemium is gradually increased, until the pain is relieved or poisonous symptoms are produced. Hypodermic injections of morphia give relief to pain, but should not be given until other remedies have failed.

8. **Injections.**—The infiltration of the sciatic nerve with normal warm saline solution and eucaine is of service in *chronic* cases. The nerve is found, with a needle 9 cm. long, in the neighbourhood of the notch, and is anæsthetized by the injection of 2 c.c. of 1·5 per cent solution of eucaine, or 5 per cent solution of novocain. After waiting a few minutes, 30 c.c. of normal saline solution is injected into the nerve. Two or three such injections may be required at intervals of a week. The local injection of $\frac{1}{3}$ to $\frac{1}{4}$ gr. of cocaine is often beneficial. Injections of sulphuric ether have been strongly recommended. The course of the nerve should be marked out, and 5 minims of ether with 2 of cocaine (1 in 12), or of liquor morphinæ, injected by means of a long needle once daily. The amount of ether may gradually be increased to 30 minims. One knows when one has struck the nerve by an involuntary shooting out of the leg.

A hypodermic-syringeful of chloroform injected into the neighbourhood of the nerve will often quickly relieve pain. Care must be taken to confine the chloroform to the subcutaneous tissues, and not to inject any into the skin itself or into the nerve. A little pain may be caused at first, but it soon passes off. The injection may be repeated daily.

9. **Change of Climate.**—A warm dry climate is that which suits most patients, and appears to be generally beneficial. The routine treatment by baths, waters, and diet at various hydropathics is often more beneficial than the same treatment when carried out at home. This is in part due to climatic conditions, but also to the enforced absence from work, which makes it possible for treatment to be carried out regularly and efficiently. Harrogate and Buxton are favourite resorts. Bath suits older patients, but does not as a rule agree so well with the younger. The brine baths of Droitwich are often very helpful in chronic cases.

10. **Surgical Treatment.**—Acupuncture of the nerve, nerve stretching, and splitting the sheath of the nerve, have all been successful in cases which have resisted other forms of treatment.

Shortly, it may be said that the treatment of sciatica consists of rest in bed, regulation of diet, diathermy, ionic medication, local application of heat, counter-irritants, or some form of liniment, the administration of drugs, and, failing a successful result from these methods, the application of electricity, acupuncture, and nerve-stretching. (*See also* Electrotherapeutics ; Nerves, Peripheral ; *and* Rheumatism, Chronic.)

F. E. Batten

(Revised by Edwin Bramwell.)

SCLERITIS.—(*See also* Episcleritis). With the deeper and more severe inflammation of the sclerotic, the ciliary body is frequently involved, and atropine must be used to keep the pupil dilated and set the ciliary muscle at rest. Secondary glaucoma is apt to occur, for the treatment of which see article on Glaucoma, p. 380.

W. Tindall Lister

SCOLIOSIS.—By scoliosis we mean lateral curvature of the spine with rotation of the vertebræ. Rotation is detected by making the patient bend forward, and then comparing the projection of the ribs and the lumbar muscles posteriorly. We see patients with spines which show no rotation when the spine is flexed, and yet, when standing, the spine is asymmetrical ; and in spite of the absence of rotation, these are put under the heading of *postural scoliosis*. Those patients showing rotation in the flexed position of the spine are suffering from *structural scoliosis*. In examining the spine, it must be bared down to the level of the sacrococcygeal joint, and the patient must be examined for other disabilities, e.g., weak feet, knock-knee, etc.

1. Treatment of Postural Scoliosis.—This deformity is associated as a rule with round shoulders and other evidences of general muscular debility, and the second point in treatment is to improve the general condition by rest, judicious exercise, and cod-liver oil, or iron in hot weather. The first point in treatment is to remove any possible cause—e.g., a short leg, whether organic or due to flexed knee or weak foot, must be corrected ; if the lumbar spine be deviated to the left, this must be corrected by tilting the left side of the pelvis by a raised heel when standing, and by sewing a pad into the knickers under the tuber ischii to provide correction when sitting. Any exercise possibly asymmetrical—e.g., riding side-saddle, the 'scooter', violin playing—must be forbidden till the muscles become capable of holding the spine straight without the conscious effort of the patient. The round shoulders must be corrected.

The patient with postural scoliosis is a potential structural scoliosis, and, when the dorsal spine is flexed, the joints are unlocked, and the possibility of a structural scoliosis developing is increased. As the patient dresses after examination, we must be certain that each garment is ample enough to allow a full expansion of the chest. It is extraordinary how very rarely do we find children with round shoulders can do this, for either the combinations have shrunk or the stays are too tight. They are comfortable in their clothes with the chest shrunken and the shoulders dropped, but the clothes are a couple of inches too small when they stand with the chest expanded and the shoulders back.

The clothes predispose to round shoulders, too, if their weight is borne over the outer ends of the clavicles by the shoulder-straps of the stays. If the patient has sufficient

waist, the stays are best replaced by a sports corset or a narrow belt to suspend the knickers and the suspenders for the stockings. If the patient has no waist—and young children have not—then the shoulder-straps must be kept close to the root of the neck by a transverse band holding them together.

After the patient is dressed, the eyes must be examined to make sure the stooping is not aggravated by the need of glasses.

In addition to regular exercises, the person in charge of the child must be instructed to be always insisting on her holding herself up, for an extended spine is much less likely ever to become a scoliotic spine.

Special exercises must be few and simple, and the patient must rest for twenty minutes after doing them. Space prevents a full description here, but 'voluntary redressement', trunk circling, and trunk twisting to both sides are the basis.

Massage cannot do any harm, but active movements are much more effective.

2. Treatment of Structural Scoliosis.—Here we have rotation of the bodies of the vertebræ, and the respiratory movements are aggravating the condition. In many cases the rotation is more marked than the amount of lateral deviation, and it is responsible for much of the obvious deformity for which the patient has demanded treatment. In the usual double curve, convex to the right in the dorsal region, convex to the left in the lumbar region, the respiratory movement in the 'right oblique' diameter of the chest (from right ribs posteriorly to left breast) is greater than the movement in the 'left oblique', and it is this inequality of the respiratory movement which aggravates the condition.

In the earlier stages of structural scoliosis, much can be done by following the same lines of treatment as described for postural scoliosis ; but, in addition, special exercises are devised, and the patient is trained, to expand the chest in the 'left oblique' diameter —to force out the left ribs posteriorly in the usual double scoliosis.

'Crawling' exercises are unsound, in that they do not allow proper expansion of the chest.

Once the deformity becomes 'fixed' by marked deformity of the bodies, it is really impossible to get rid of the lateral curve, but the rotatory deformity can be very much improved by 'Abbott's jackets'. If this line of treatment be inadvisable, then some support or a corset should be fitted. I do not believe we are justified in promising a patient that, untreated, he will not get worse, for apparently the deformity may remain stationary for years, and then suddenly increase for no clear reason.

There are four lines of treatment to be described : (*a*) Abbott's jackets ; (*b*) Supports ; (*c*) Corsets ; (*d*) General palliative treatment.

a. Abbott's Jackets are plaster jackets applied when the patient is in the very best possible position with the spine flexed to unlock the vertebral joints, and with a window posteriorly to allow the depressed ribs to expand—usually on the left side. As the ribs expand, pads of felt are forced in anteriorly in front of the left chest ; these diminish the capacity of the jacket and compel the patient, by her respiratory movements, to expand the ribs posteriorly still more.

The patient must be prepared to put up with a considerable amount of discomfort, for the first few days at any rate, and when the jacket or jackets have done their work, to persevere with exercises, general and special, to restore the muscles and maintain the correction. The patient can have the assurance that it is worth while. The surgeon will find the application of the jacket a strenuous bit of work, and he must be able to superintend the packing with felt afterwards two or three times a week. Undoubtedly for young people, and for those who show rotatory deformity in the lower dorsal region especially, and who can maintain the correction by a temporary support and exercises afterwards, we have in Abbott's jackets a more successful line of treatment than any hitherto suggested.

b. Supports.—The most practical support I know is modelled on the lines suggested originally by Mr. Noble Smith. It allows free expansion of the chest, and is helpful to the patient when standing and sitting. From the pelvic band, a broad tongue runs down behind the sacrum and rests on the chair when the patient is sitting. From the upper part of the two light posterior steel bars runs a shoulder-strap on each side, holding the shoulders up and back as the lower end rests on the chair. At the same time an

abdominal band holds the lower part of the trunk closer to the two steel bars, and so the patient is prevented from 'collapsing' in the chair as so many of them do, and the flexion of the trunk, so favourable to increased deformity, is prevented. Light padded plates support the ribs posteriorly, and the whole apparatus is adjustable, so that as the patient improves in shape her contour can be followed.

The improvement in general health from the application of such a support is often very marked. Expansion of the chest is encouraged by the improved position of the patient, and the apparatus can be readily removed in a few minutes for exercises. For the first few weeks the stretching of the shortened soft parts may give rise to discomfort, but it is worth it.

c. Corsets.—The type of corset suitable for a 'fixed' scoliosis is made of leather strengthened with steels, and with an oval flap corresponding to the major projection of ribs posteriorly. The pressure of this flap on the ribs can be adjusted by a broad band of webbing with straps and buckles.

These corsets do not allow free use of the chest; but where the scoliosis is due to an old infantile paralysis, often when it is due to a congenital deformity, when it is due to a fibroid lung, when the muscles are really hopelessly atrophied, or when the patient cannot be kept under observation, then the leather corset and flap is sound treatment.

d. General Treatment.—In people advanced in years, with a tendency to bronchitis and emphysema, the leather corset is out of the question. A support may readily give relief, and even some improvement in shape; but if the surgeon comes to the conclusion that such is unnecessary, and the pain is due to osteo-arthritic changes in the joints, a good deal can be done by iodides or guaiacum internally, local counter-irritants—e.g. iodine or liniments—or Tyrnhauer baths. *Robert Milne*

SCURVY.—Try in the first place to get the patient away from the surroundings amidst which the disease has developed, and to place him in more hygienic conditions, chief amongst which are warmth, dryness, and fresh air. A radical alteration must be made in the diet, fresh vegetables and fruits, milk, and fresh meat being abundantly supplied. Lemonade made from fresh lemons should be given as a beverage. Fresh infusion of malt is another powerful antiscorbutic, and several pints of it may be taken in the day. Cider and the French and Italian wines are also curative drinks. If the gums are spongy, they should be brushed with solid nitrate of silver every day, and an antiseptic and astringent mouth-washes used freely, e.g.:—

℞				
	Aluminis	gr. v	Tincturæ Myrrhæ	℥x
	Acidi Sulphurici Diluti	℥x	Aquæ Destillatæ	q.s. ad ℥j

If bleeding be excessive, adrenalin may be applied locally. If diarrhœa be present it should be treated with bismuth and opium. An extract of fresh bael fruit has also been highly recommended in this complication. For subperiosteal hæmorrhages and haematic swellings in the popliteal spaces and elsewhere, iodide of potash should be exhibited, and gentle massage used locally. If there be heart weakness, the patient must be kept recumbent for a long time and strychnine administered. Complications should be treated on general principles, and iron administered during convalescence.

The Prophylaxis of scurvy demands attention to general hygiene, particularly the avoidance of overcrowding, and, most of all, the provision of a sufficiency of fresh elements in the dietary. If fresh vegetables or fruits are not available, 1 oz. of preserved lemon-juice should be given every day, although it is apt to produce 'heartburn' in some subjects. Of preserved vegetables, 'sauerkraut' and canned tomatoes are the best anti-scorbutics. Sprouted seeds have a considerable antiscorbutic value. Any available seed may be used. They should be soaked in water for twenty-four hours and kept moist with access of air for one to three days, by which time they will have sprouted. They should be cooked for as short a time as possible, and eaten like vegetables. Fresh meat, even if eaten alone, is sufficient to prevent attacks of the disease. *Robert Hutchison*

SCURVY, INFANTILE.—The use of any tinned or proprietary food should at once be stopped, and the child put upon pure unboiled cow's milk. This may be supplemented by raw meat-juice, made by adding to finely-minced steak one-fourth of its volume

cold water, allowing to soak for an hour, and then squeezing through muslin. One ounce of the juice may be given in twenty-four hours. Broths in which a muslin bag containing chopped potato, carrot, or other fresh vegetables has been suspended during cooking, are also useful, or the floury part of a baked potato may be rubbed up with some of the milk into a thin cream. A few teaspoonfuls of orange- or grape-juice should also be given every day. The use of drugs is unnecessary, but if rickets be present, as it usually is, cod-liver oil and iron should be administered.

If the legs are affected, they should be wrapped in cotton-wool secured by a light bandage, or swathed in wet towels which are allowed to dry *in situ* after they have adapted themselves to the contour of the limbs. A sand-bag should be placed on each side of the legs, and the weight of the bedclothes kept off them by a cage. If the arms are tender, they should be fixed by bandaging them gently to the chest.

Robert Hutchison.

SEA-SICKNESS.—Prior to undertaking a voyage, a simple diet should be observed for a few days, and the bowels freely opened on one or two occasions by a dose of blue pill, followed by a saline draught. If the sea passage be of short duration (less than twelve hours), a draught of chloral and bromide of ammonuim (30 gr. of each) should be taken before starting, and the patient should assume a recumbent position on going on board, preferably lying on his right side with the knees well drawn up. A tight abdominal binder is found to be a useful adjuvant in many cases. As a preparation for a longer voyage, 20 gr. of bromide of ammonium should be administered three times a day for two days before the journey is begun, and similar, or larger, doses should be continued for a few days after sailing. As soon as any discomfort is experienced, the patient should seek his cabin and lie down as described above. He should abstain from all solid food, thirst being relieved by sucking fragments of ice, and if there be much depression, iced champagne may be given freely. If the sedative action of bromides is found insufficient, other narcotics may be tried, such as chloretone (5 gr. in capsule every three or four hours) or validol (10 to 15 drops on sugar, repeated as required). For the Channel passage, chloretone may be given in 5-gr. doses (in capsule) every three hours for three doses, the last being taken when going on board. Other useful sedatives are chlorobrom which contains 30 gr. of chloral formamide and bromide of potassium in each oz.) in doses of from 2 to 4 drachms, repeated if necessary; hydrobromide of hyoscine ($\frac{1}{200}$ gr. by mouth or hypodermically); and cocaine, $\frac{1}{8}$ gr. in 1 oz. of chloroform water. The proprietary preparations 'Zotos' and 'Mothersill' contain chloretone; 'Yanatas' chiefly depends for its activity upon bromide of potassium. In very severe cases, with prolonged vomiting, leading to exhaustion and collapse, it may be necessary to have recourse to the injection of morphia.

The hypodermic injection of strychnine sulphate ($\frac{1}{60}$ to $\frac{1}{30}$ gr.) along with atropine sulphate ($\frac{1}{150}$ gr.), or of atropine ($\frac{1}{50}$ to $\frac{1}{30}$ gr.) alone, has also been recommended. The injection should be given at the very onset of nausea or discomfort, or as a prophylactic in sensitive persons, and may be repeated in a few hours if necessary in half the quantity. If the blood-pressure is very low, adrenalin may be combined with atropine with advantage.

Robert Hutchison.

SEBORRHŒA.—The essential treatment of this condition is frequent washing of the scalp. This should be done with soap spirit, and it is important that the soap should be thoroughly washed out, not only with the water in which the washing has taken place, but with two or three fresh waters as well.

The most generally useful application is an ointment of sulphur and salicylic acid, and it must be borne in mind that the scalp will tolerate more concentrated remedies than most parts of the surface. The active ingredients should be in a strength of not less than per cent, and may be used much stronger in suitable cases. Resorcin in the same strength quite efficient, but it has the effect, not always appreciated by the patient, of giving the hair a distinctly auburn tinge.

On the body, the parts should be thoroughly washed, and one is guided with regard the application by the degree of reaction in the skin. Thus, if the eruption is moist, paste should be used, while if dry, an ointment is preferable. If the eruption is very extensive, mere economical considerations will suggest the use of a lotion.

The same drugs, sulphur and salicylic acid, are indicated, and although the applicatio may be a little painful, the results are more rapid if they are used much stronger tha usual. Much benefit, for instance, often results from a paste containing 15 or 20 per cen each of sulphur and salicylic acid, though obviously such cannot be applied to an extensiv eruption. Indeed, one may say that the recognition of the seborrhœic element in dermatitis is an indication to make the active ingredients in one's prescriptions sulphu and salicylic acid.

Norman Walke

SEPTICÆMIA and PYÆMIA.—These two diseases are closely allied; indeed, th term pyosepticæmia has been coined to show the close relation between the two con ditions. Strictly speaking, in *septicæmia* pathogenic micro-organisms are present in th blood-stream, producing severe constitutional effects by their toxic action on the tissues in *pyæmia* a similar state of things is present, but there is a tendency to the developmen of multiple abscesses from localization of the process.

When once established, the treatment of *septicæmia* and *pyæmia* is almost entirel symptomatic. Wounds which have been responsible for the admission of the bacteri should certainly be treated by thorough evacuation and irrigation with antiseptics; bu although this plan may prevent the further invasion of the tissues, it is clearly powerles to deal with those organisms which have already entered the circulation; besides, thes diseases often arise from infections without any external wounds.

In cases of pyæmia where veins are full of infected clot, good results are said t follow the ligature of the main veins so as to prevent any further detachment of emboli particles into the circulation. Such treatment, eminently satisfactory in lateral sinu thrombosis, has been applied to the veins of the extremity in osteomyelitis, and to th pelvic veins in pyosepticæmia of uterine origin. It is too early yet to say whether th treatment should be recommended.

Apart from the details above mentioned, the treatment must be directed to mai taining the nutrition of the patient, so as to enable him to fight his invading enemy.

Diet must consist of foods rich in nourishment and easily assimilated—strong soup beef extracts, eggs, plasmon, etc. Alcohol is of undoubted value, and may be use freely.

Drugs.—Iron, arsenic, quinine, opium, are found to be of service. Large doses perchloride of iron have appeared very beneficial in septic states; it is, however, n always tolerated by the stomach. Opium in one of its various forms may be given relieve the restlessness, delirium, and pain.

Saline injections, either into the veins, the subcutaneous tissues, or the rectum, a very valuable. The saline solution dilutes the toxins and nourishes the tissues. Sor authorities recommend that bleeding should be performed to remove some of the blo charged with poisonous substances. This treatment cannot be recommended, since t removal of a small quantity of blood, 8 to 10 oz., cannot really affect the amount poison present in the body, while the abstraction of larger quantities will seriously weak the patient. With regard to the injection of antiseptics into the blood-stream, we ha little to say. Credé claims good results with collargol, injected into the veins of the ar Various strengths have been used; Wassermuth has used it as strong as 2 per cent., which 6 c.c. were injected into the median basilic vein with, it is stated, an excell result. Experiments made in the laboratory do not give any proof of the efficacy of an septic injections in conditions of septicæmia and pyæmia, but the condition is so despera and this remedy apparently so harmless, that it may be tried. There is no evidence show that transfusion of blood is beneficial for septicæmia *per se*.

Vaccine treatment has been used in some very severe cases of pyæmia and has b followed by success.

Any secondary abscesses which form in pyæmic states must be opened and drain

W. H. Clayton-Gre

SEPTUM NASI, ABNORMALITIES OF.

1. Thickenings, Deflections, and Dislocations.—Some irregularity of the nasal sept is extremely common; in fact, a symmetrical septum is hardly ever met with. The gr majority of deviations of the septum, and such irregularities as are generally term

ridges, spurs, or crests, produce no symptoms and require no treatment. It is only when the deformity of the septum is sufficient to produce nasal obstruction or other definite symptoms, that treatment becomes necessary. Even when obstruction is present, especially if not of long standing, it may be found to depend upon catarrhal swelling of the nasal mucous membrane, in which case the treatment for Rhinitis, Chronic (q.v.) should be adopted, and no surgical interference may be required. When, on the other hand, there is marked deformity of the septum, causing unilateral or bilateral obstruction; when the patient suffers from repeated attacks of acute rhinitis, or from chronic rhinitis which does not yield to simple treatment, or from other symptoms which can be reasonably attributed to the nasal condition, surgical measures must be advised to restore a free air-way through the nose. The important points to bear in mind are that a free air-way through the nose should be restored with as little damage to the nasal mucous membrane and as little general inconvenience and danger to the patient as possible. Also it is expedient to take special care in advising and in performing an operation on children, as apparently the natural growth of the parts has occasionally been arrested, and marked depression of the bridge of the nose has resulted.

The deformity of the septum may be a simple thickened ridge or spur, or a deflection of the cartilaginous or bony septum accompanied by more or less thickening of the deflected part, but sometimes only the anterior part of the cartilage is much affected. A well-marked deflection of the septum, with or without thickening, is best treated by a submucous resection. The chief points of the operation are as follows: Both sides of the septum should be plastered with small pledgets of wool or gauze soaked in a 2 per cent solution of cocaine and suprarenal extract (1–1000), and lightly squeezed before being applied at least half an hour before commencing the operation. Many surgeons refer to operate under local anæsthesia alone, but I think it is usually best to give also a general anæsthetic. The application of cocaine and suprarenal extract not only prevents hæmorrhage during the operation, but by producing local anæsthesia allows of very light general anæsthesia. Just sufficient chloroform should be given to abolish consciousness, but not enough to affect the pharyngeal and laryngeal reflexes.

The operation is carried out in a darkened room by the aid of strong reflected light; and, whether a general anæsthetic is given or not, the patient should recline on a couch with the head slightly raised and turned to face the operator. The speculum is introduced into the narrowed nostril and an incision made on the convex side of the septum just in front of the deflected portion. This incision should be deepened carefully so as to divide the mucous membrane, perichondrium, and cartilage, but it must not penetrate the perichondrium and mucous membrane on the opposite side. It should be straight or slightly curved, and, if there be a marked ridge on the floor of the nose, should be carried back for a slight distance under this ridge. With a small blunt dissector, the mucous membrane and the perichondrium are now separated backward from the incision on both sides of the cartilage. In separating them on the convexity, great care must be exercised to prevent tearing the mucous membrane. The cartilage, when it has been bared, is cut away with a Killian's or Ballenger's septum knife. Into the opening thus made nasal specula with long blades, such as Thomson's, are introduced, and the periosteum is separated from the bony septum on either side as far back as the deflection or thickening extends. The deflected or thickened bony portions are now broken away and removed by strong forceps, such as Luc's. There is often a particularly thick and hard ridge of bone near the floor of the nose, which is most easily removed with chisel and hammer. The operation must be continued until the whole of the affected part of the septum has been removed. The soft parts of the two sides of the septum are now allowed to fall in contact, and the edges of the incision are carefully adjusted. Next, any hypertrophy of the inferior turbinates or other cause of nasal obstruction must be removed. Many surgeons pack the nose with strips of gauze or various splints. There is no need for this. The two sides of the septum fall naturally together, and the hæmorrhage seems to be actually more when the nose is packed than when it is left clear. Moreover, the packing is very uncomfortable, and its removal is painful and sets up fresh bleeding. The only after-treatment required consists in keeping the nostrils clean by swabbing with hydrogen peroxide, and, if there is much nasty discharge, syringing the nose very gently with boracic lotion or other mild antiseptics. The results of the operation are excellent.

The incision heals in a few days, and a perfectly straight septum is left, without any perforation. There is no raw surface to heal over, and therefore no tendency to subsequent crusting.

When the deformity of the septum is limited to a bony ridge or spur far back in the nose, its removal where necessary is very simple. Some cocaine and suprarenal extract should be applied to allow of a good view of the affected part, then nitrous oxide may be administered. A good light being thrown into the nose, the blade of a spokeshave is passed over the posterior end of the ridge and drawn sharply and strongly forward. In this way the ridge is generally brought cleanly away, and the removal of a small portion of the mucous membrane in the posterior part of the nose produces no ill-effect.

In children, the operation of submucous resection is difficult owing to the small size of the parts. It is dangerous also to take away too much of the septum, as the operation may possibly interfere with its continued growth, and result subsequently in a falling-in of the bridge of the nose. This result has certainly followed the operation in some cases. When the amount of obstruction in children is such that it is necessary to do something, I think it is wiser to carry out a partial submucous resection. Cocaine and adrenalin should be applied in the usual way and a general anæsthetic should be given. The operation is then carried out as above described, but only the most deflected and thickened part of the septum is touched. The apex, as it were, of the deflected portion is removed, but special care is taken to preserve a large piece of the septum above the deflection, so as not to approach too near the bridge of the nose. In this way sufficient can usually be removed to give a fair air-way through the nose without risk of deformity, and as the nose continues to grow larger, the septum will probably grow straighter. It must also be borne in mind that the removal of adenoids or portions of turbinates, especially of the inferior turbinates, either anteriorly or posteriorly, may give a sufficient air-way without touching the septum.

2. **Adhesions between Septum and Turbinates.**—Adhesions between the turbinates and the septum require treatment when they produce nasal obstruction, or prevent the removal of nasal secretion, or interfere with intranasal treatment. Slender bands may be removed under local anæsthesia with punch forceps, or destroyed by the electric cautery. An extensive adhesion is usually the result of an imperfect operation upon the septum or upon a hypertrophied inferior turbinate in a narrow nose, when the opposing surfaces of mucous membrane have been simultaneously denuded of epithelium without the removal of a sufficiently large portion to keep the wounded surfaces apart. The best treatment is to cut through the attachment of the inferior turbinate with stout scissors as in anterior turbinectomy, and then with the spokeshave to remove the adherent portion of the turbinate, together with the whole of the septal ridge. In this way the wounded surfaces are so far apart that there is no tendency for the adhesion to re-form. The nose should be watched until healing has taken place, so that if any exuberant granulation form they may be at once removed.

3. **Abscess of Septum Nasi.**—This usually results from trauma: it is a suppurating hæmatoma. When it is certain that pus is present, free incisions should be made into the most prominent part of the swelling on each side of the septum. A general anæsthetic is usually necessary, as cocaine has little effect. The incisions should be as large as possible and they should be kept open by inserting a probe every day for the first few days after the operation. When all discharge has ceased, the incisions should be allowed to close. As a rule, this method is followed by a complete cure, but in a few cases the incisions show a great tendency to heal rapidly, and the pus re-accumulates. If this occur, it is best to snip out a portion of the abscess wall and thus secure effective drainage. Occasionally also, if operation has been too long delayed, necrosis of the cartilage may occur and delay the healing. When there has been delay in opening the abscess, or when the original injury was severe, considerable deformity (a sinking in of the bridge) of the nose may ultimately result. *H. Lambert Lack*

SETON, TREATMENT BY.—For many centuries the seton has been used for curing or alleviating diseases that tended to assume a chronic nature. In reviewing the literature on the subject it becomes evident that whenever there seemed a possibility of its falling into disuse it was at once revived and very highly extolled by members of the profession

who had derived undeniable benefit from its employment. The diseases that were treated by it in the past were as varied in character as they were numerous, and among them may be briefly mentioned: tuberculous disease in all its aspects, diseases of the eyes, diseases of the nose—especially ozæna—chronic discharge of the ears, chronic laryngitis, tumours, sciatica, and affections of the brain with or without paralysis.

How the Seton Acts.—The chief actions of a seton may be regarded as: (1) Counter-irritating, and (2) Suggestive. In olden times the seton was regarded almost exclusively as an *eliminant* (or 'evacuant' as it was then called), whereby certain noxious elements were got rid of from the body by means of the continued discharge it occasioned. Now, however, we do not feel justified in attributing to this action of the seton the importance conferred upon it by our medical forefathers. The discharge occasioned by a seton is, as a rule, not profuse; so that it is improbable that the small amount of discarded constituents of the blood, whether of a physiological or a chemical nature, could produce any signal effect. In the *counter-irritating* action of a seton undoubtedly lies its chief power. The full physiological action of a long-continued counter-irritation has yet to be explained, but the localized determination of blood, with its concurrent leucocytosis, at the seton site is surely responsible for a lessened hyperæmia in a disordered part, if the seton be placed in its near proximity. This is probably brought about by the intervention of the vasomotor system. As an example it may be mentioned that distressing attacks of vertigo (with or without Ménière's complex of symptoms), due to hyperæmia of the labyrinthine vessels, which have persistently resisted every other recognized form of treatment, have been either entirely cured or much alleviated by a seton placed at a spot midway between the nape of the neck and the mastoid process on the affected side. The *suggestive* or hypnotic action is also, in some cases, a strong remedial agent. Whether this be brought about by afferent impulses reaching the central nervous system from the seton site, and reflected down efferent channels to the seat of the disorder, inducing tonic vasomotor changes in this abnormal hyperæmic or anæmic area, or whether the result be effected by more obscure psychological causes, it would be unwise to dogmatize.

Indications for the Use of the Seton.—Within the last few years the seton has been used with marked effect in certain distressing chronic affections which are characterized by acute paroxysmal outbursts. This class of case has at first usually received at the hands of competent men the best remedial treatment that can be adopted, but with little or no improvement. A seton has been tried as a *dernier ressort*, with a result that has oftentimes astonished the practitioner. Among those diseases likely to be benefited by seton treatment are migraine, chronic congestive headache or hemicrania, chronic neuralgia, Ménière's symptoms, Ménière's disease, symptoms of obscure cerebral or cerebellar disease, and epilepsy. It has also been used with success in rheumatoid arthritis.

How to Make and Use a Seton.—The simplest way to make a seton is to use a specially constructed knife. This instrument consists of a steel shaft with a sharp-pointed, gradually-thickening, harpoon-shaped blade at one end, and a broadened-out handle bearing an eye large enough to carry a half or three-quarter-inch tape at the other. All that is necessary to be done is to pinch up a fold of skin between the thumb and forefinger of the left hand, and with a stabbing-like thrust, pass, with the right, the seton knife-needle, loaded with its tape, through the base of the fold, piercing the double layer of skin, and draw the instrument through. When the knife has been disengaged and the two ends of the tape have been secured, the seton is made.

Several points should be observed in carrying out this little operation:—

1. It is best to make the stab in a slanting direction, so that the discharge may gravitate to the lower opening.

2. The fold of skin should be held and the knife passed in such a manner that the entrance and exit incisions should lie at least from 1½ to 2 inches apart. There is a strong tendency for a seton to heal, and it will be found that if a fair space be not left between the little wounds, the bridge of skin will quickly become thinned and gradually disappear, so that the making of a fresh seton becomes imperative.

3. For the latter reason also it is advisable to make the incisions a little larger than the breadth of the tape, in order that the wounds may not contract by healing too rapidly upon the tape. This can be done by a little sawing movement as the knife-needle is

passing through the fold of skin. It is best to do this little operation under nitrous oxide gas.

For the making of a seton various substances have been employed. Cords made of silk were common in past times, and were found of practical value. Specially prepared seton-tape, with a glossy surface to avoid contamination with the discharge, can be procured from any surgical instrument maker, and is highly recommended by those who employ the side-to-side method. The writer, however, recommends ordinary domestic tape as being as serviceable a material as any, and he would recommend its being used in the following manner: Take a piece of tape ½ to ¾ in. wide and about 20 in. long. Thread the tape into the eye of the knife-needle (*Fig.* 64), having previously sterilized tape and knife. It used to be considered rather a favourable circumstance for the wounds to become septic, as it was thought to intensify the action of the seton. This is not at all necessary, and in the writer's opinion it is dangerous. The reason for choosing so long a piece of tape is that the ancient method of pulling the same piece of material from side to side each day is unsurgical as well as extremely offensive to the patient. When, therefore, the tape has been passed, the short end should be secured by means of a safety pin to that portion of the 'long end' that lies immediately outside the upper wound. The

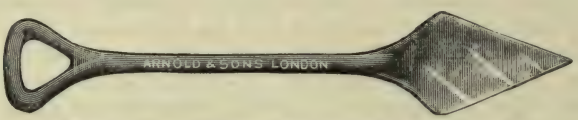


Fig. 64.—Seton Knife-needle, three-fourths natural size.

rest of the 'long end' is folded and placed in a boric-lint or oiled-silk pocket to ensure its being kept aseptic. Each day the 'short end' is pulled so that that portion of the tape that has rested in the wound during the previous twenty-four hours is drawn out and cut off, and a fresh portion of the 'long end' takes its place. When the 20 inches of tape is almost expended, a second length of sterilized tape is sewn on to the upper end of the old piece and the story continued as before.

When no special instrument is at hand for the making of a seton, it can be managed, though not so comfortably, by means of an ordinary long-bladed scalpel and a sterilized bodkin. Under nitrous oxide gas a fold of skin is pinched up as before, and the scalpel inserted and held in position till the bodkin bearing the sterilized tape has been introduced. As this is being passed, the blade of the knife is withdrawn and the tape pulled through.

Each day the wound should receive an antiseptic wipe with a piece of lint moistened in some antiseptic lotion, after which it should be well dried and covered with a pad of boric lint. There is little pain or discomfort in the wearing of a seton, and the relief it affords for severe paroxysms of pain or vertigo will more than compensate for any slight inconvenience it may cause. For any severe chronic condition it should be kept *in situ* for from three to six months. *T. Wilson Parry.*

SHOCK, SURGICAL.—As in the case of sepsis, it is easier to prevent shock than to treat it when once it has developed, and the greatest attention must be paid to preventing its occurrence during surgical procedures.

Prevention.—As a general rule, it may be stated that the degree of shock produced by an operation is dependent upon the amount of traumatism to the nerve elements of the parts operated upon. The degree of shock is in direct proportion to the area of skin and muscle injured, and the relative number of nerve-endings in them. Hæmorrhage during operation is an important contributory cause. In operations upon the abdomen, the extent of the shock produced depends very much upon the area of peritoneum exposed and the duration of the exposure. Any form of manipulation of the peritoneum, such as traction upon it, sponging, flushing with hot water, and even simple exposure, causes a fall in blood-pressure. Evisceration and extensive intra-abdominal manipulation, especially in the upper regions of the abdomen, very soon produce shock. For these reasons it is advisable to avoid lengthy operations and to reduce the handling of the tissues to the irreducible minimum. Much can also be done to prevent shock by keeping the patient warm and covered up as much as possible during operations. In

cases where shock is likely to be a serious danger, it is important to avoid free purging just before operation, and the bowels should be emptied some two days previously; also such patients must not be starved previous to operation, except for a few hours. Small doses of strychnine administered every day for a week prior to operation are useful, and a morphia injection of ¼ gr. hypodermically just before commencing the anæsthetic is a most valuable means of combating shock.

A very great deal can be done to prevent shock by special methods of anæsthesia; in fact the true shockless operation is not only a possibility but an accomplished fact. In a shockless operation the area of the operation is shut off from the sensorium by means of local anæsthesia. This anæsthesia must be so complete that if the patient were conscious no pain would be felt. Every sensitive tissue is injected with a solution of 1–200 novocain before being divided, or, what is better if it can be done, the main sensory nerve-trunks are injected so as similarly to shut off the desired area.

The operation itself is performed in such a manner as to cause the least possible trauma—that is to say, with light handling and sharp cutting, tearing and blunt dissection being inadmissible. Meanwhile the patient is kept in a condition of artificial sleep by a suitable combination of anæsthetics. First of all, a preliminary injection of morphia (or morphine and scopolamine) is given, the dose of which varies according to the type of patient, and is roughly from ⅛ to ½ gr. This should be given an hour before operation, so that the full effects are felt at the time of induction of anæsthesia. Secondly, a general anæsthetic is administered in order to keep the patient quite unconscious. The object of the general anæsthetic, however, is only to produce unconsciousness, and not relaxation or even anæsthesia.

Another method is to perform the operation under spinal anæsthesia, and gas and oxygen, or 'twilight sleep'.

The advantages of the shockless method of operating are much lighter anæsthesia, with, consequently, less probability of subsequent sickness, almost complete absence of post-operative pain, absence of rigidity, and, most important of all, complete absence of shock even after severe and prolonged operations. The great advantages are more particularly seen in serious operations upon elderly or feeble subjects, and where an operation has to be performed upon an individual who is especially liable to have post-operative vomiting.

It must not be supposed that the shockless operation is just a new method which can easily be adopted. It is not so much a method as a series of principles, by the careful co-ordination and co-operation of which the desired result can alone be obtained. The surgeon who wishes to achieve success with the shockless operation must have much patience and take a great deal of trouble to acquire the necessary technique; and he must have an anæsthetist, an assistant, and nurses who understand, and are capable of applying, the necessary principles.

Those who are particularly interested in these methods are advised to read the following: Crile and Lower, *Anoci-association*, 1914; Moynihan, *Abdominal Operations*, 1914; Gray, *Brit. Med. Jour.*, 1916, Jan. 1; 'The Shockless Operation', Lockhart-Mummery, *Loncet*, 1916, July 1.

Treatment.—*Strychnine and other stimulants must not be given, as they tend to increase the shock*, and not, as was previously supposed, to get rid of it. The foot of the patient's bed should be raised on blocks sufficiently to make the head the lowest part of the body. Bandaging the limbs is also useful in bad cases.

Large rectal injections of warm saline solution should be given. The fluid should be run in slowly with the buttocks well raised; two or three pints should be injected in this way with a douche syringe, and repeated if benefit results. This is not of much use in severe cases, however, as the fluid is not absorbed. In such cases intravenous infusion with physiological saline solution should be performed at once, and kept up, or repeated at frequent intervals. To be successful, intravenous infusion with an isotonic glucose solution must be done early, and several pints of solution allowed to flow into the veins. It does the greatest amount of good in collapse due to hæmorrhage, because in such cases the nerve centres are not exhausted.

There are two drugs which are of great value in the treatment of shock, if properly used. One is the extract of the infundibular portion of the pituitary gland. (This drug

is now obtainable in sealed capsules from the leading pharmaceutical chemists.) Pituitary extract should be given in a 1-c.c. dose subcutaneously, and repeated in four hours. This drug holds up the arterial pressure by direct action on the peripheral vessels, and is of considerable value.

Adrenalin is the other drug, and can be administered as an intravenous infusion in the strength of 1–50,000 ; it must be given very slowly and continuously. Unfortunately, although experimentally this is very successful, in actual practice it is too difficult to control the dosage, and too large a one may cause serious embarrassment of the heart. It should be used in conjunction with frequent blood-pressure readings. For these reasons pituitary extract injections and intravenous infusion with glucose are to be preferred.

The injection of adrenalin subcutaneously is useless. The pituitary extract is not quite so powerful as adrenalin, but its effects are more lasting ; it can also be used as a subcutaneous injection. No drug, however, is of any use administered subcutaneously in severe cases of shock, as there is not sufficient capillary circulation to get it into the main blood-stream.

The treatment may be summarized as follows : (1) Do not give stimulants ; (2) Raise the blood-pressure in the vital parts of the circulation by raising the foot of the bed and by bandaging the abdomen and limbs ; (3) Give hypodermic injections of morphia to cut off inflowing sensory stimuli ; (4) Perform intravenous infusion as early as possible ; (5) If the shock continues for some time, give nourishment either by mouth or rectum ; (6) Give an injection of pituitary extract ; (7) Keep the patient warm.

Deferred Shock.—This is frequently seen in children and in old people. The shock comes on some four or five hours after operation. It is best treated by small injections of morphia. *J. P. Lockhart-Mummery*

SINUSITIS, ACCESSORY.—(*See* Nose, Accessory Sinuses of.)

SKULL, FRACTURES OF.—From the point of view of treatment, fractures of the skull may be classified as follows : (1) *Fractures of the vault without depression* ; (2) *Fractures of the vault with depression* ; (3) *Fractures of the base.* Any one of these may be simple or compound.

1. **Fractures of the Vault without Depression.**—It is unlikely that this lesion will be diagnosed with certainty unless it be compound, in which case a fine red line of fracture will be seen crossing the exposed bone at the bottom of the scalp wound. The occurrence of a linear hæmatoma should, however, cause the existence of a fracture to be suspected. In all cases of fracture or suspected fracture, whether of vault or base, the importance of complete and sufficiently prolonged rest cannot be over-estimated. The patient should be put to bed in a darkened room, he should be kept free from worry, and the visits of friends and relations as far as possible controlled. A purge should be administered at the outset, and attention should subsequently be paid to the regular evacuation of the bowels. The diet should consist of 'slops', and stimulants be altogether withheld. The appropriate treatment for scalp wound or hæmatoma, should such exist, is carried out and a careful watch is kept for signs of compression or indications of intracranial hæmorrhage or suppuration. When a fracture has taken place, it is necessary that the patient should not return to work for at least six weeks. (*See also* Brain, Concussion of.)

2. **Fractures of the Vault with Depression.**—The general treatment is the same as for fractures without depression, but it is necessary in dealing with injuries of this class to realize clearly certain well-substantiated facts. In the first place, the amount of depression which is apparent to the observer by external examination is no safe index to the amount of pressure on the brain beneath ; a slight depression of the outer table may be, and often is, associated with extensive splintering and depression of the inner table, the fragments of which may be pressing upon and lacerating the underlying brain. Again, the absence of immediate signs of compression does not in the least indicate that no ultimate trouble is to be apprehended ; fragments may be pressing upon or even lacerating the cerebral tissue, and only give note of their existence by the subsequent development of persistent headache or Jacksonian epilepsy. Further, the operation for the removal of depressed bone is, in present circumstances, devoid of risk. For these reasons it is advised that all cases of depressed fracture, whether simple or compound

whether accompanied or not by signs of compression, should be submitted to immediate operation. (A single exception may be made to this rule : in the case of extensive shallow depressions in infants and young children operation is not called for in the absence of signs of compression of the brain.) A flap of sufficient size is turned down, or the wound, if such exist, is excised and extended, and the depressed area is thus freely exposed. If there be a small depressed area, a disc of bone may be removed with a trephine so as to include it. If more extensive depression exist, a trephine hole should be made at the edge of the depression and the fragments removed by means of elevator and sequestrum forceps. Often when there is extensive comminution of the bone, the fragments may be removed readily without the use of a trephine. In simple fractures where there are large pieces of bone depressed, it may be advisable to raise them to their normal level by means of an elevator, and leave them. In compound fractures the danger of necrosis of loose fragments is too great to warrant the attempt to save them. The gap left becomes filled in by a dense and tough fibrous membrane which, unless the deficiency be very wide, affords good protection. Any lacerations of the dura must be closed carefully with fine sutures. The operation being completed, the flap is stitched into position, a drainage tube being left in for twenty-four hours.

3. **Fractures of the Base.**—The general treatment called for is that given under the heading of *Fractures of the Vault without Depression*. It must be remembered, however, that fractures of the base are, more often than not, compound. When the anterior fossa is affected, the cavity of the nose is opened ; when it is the middle fossa which is fractured, the ear or the roof of the nasopharynx may be involved ; whilst in the case of the posterior fossa, the latter cavity is again likely to suffer. It follows, therefore, that the chief object towards which treatment must be directed is the prevention or the minimization of the risk of the involvement of the brain and its meninges in septic processes originating in and spreading from the cavities above-mentioned. If the fracture involve the nasal cavity, that cavity is sprayed frequently with a lotion containing 10 gr. each of sodium bicarbonate and borax and 1 gr. of carbolic acid to each ounce, after which iodoform powder may be insufflated. When the ear is involved, it should be swabbed out gently with carbolic lotion (1–60), and protected by a dressing. When the cavity of the mouth is opened, the nasopharynx is to be kept as clean as possible by the use of the nasal spray and antiseptic mouth-washes. Basal fractures are often accompanied by intradural hæmorrhage, giving rise to symptoms of generalized compression. Should definite symptoms of this nature be present, a decompressive operation (*see* p. 420) should be performed. Some surgeons claim to have improved their results in treating basal fractures by the routine performance of a subtemporal decompression on one or both sides.

S. Maynard Smith.

SKULL, GUNSHOT WOUNDS OF.—(*See* Gunshot Wounds.)

SLEEPING SICKNESS.—(*See* Trypanosomiasis.)

SLEEPLESSNESS.—(*See* Insomnia.)

SMALL-POX.—(*See also* Fevers, Acute Infectious.) Mild, discrete, and modified cases require little special treatment ; but in the severer forms, both general treatment of the febrile symptoms, and local treatment of the eruption, require attention.

The lumbar pain so frequently occurring during the *prodromal period* may be relieved by the application of linseed-meal poultices, or belladonna and glycerin, to the loins ; for vomiting, morphia is the best remedy ; for sleeplessness and delirium, opium.

When the *eruption* is at all copious, the hair and beard should be cut short. In the early stages of the eruption, the cutaneous swelling and irritation call for relief ; this is best afforded by the application of cold—even iced—water compresses, frequently renewed ; or of lint soaked in glycerin (1 drachm) and iced water (1 oz.), covered with oiled silk. If these applications are not agreeable to the patient, an astringent powder should be dusted over the skin, such as starch and oxide of zinc, boric acid, or fullers' earth.

Another useful method of treatment is to paint the skin with undiluted weak tincture of iodine ; this should be commenced as early as possible in the eruptive stage, and continued once or twice a day. After eight or nine days the skin begins to peel ; the

iodine should then be discontinued, and some antiseptic ointment be applied. In patients whose skin is very sensitive, the undiluted weak tincture of iodine is too strong, and a weaker solution must be used. Some patients cannot bear the iodine at all, and recourse must be had to some other method (Welch and Schamberg).

When *scabs and crusts* have formed, the object should be to hasten their separation; and this is best accomplished by the use of moist applications; dry applications must on no account be used. The best treatment is that employed by the late Dr. J. MacCombie: A mask is made of a single thickness of lint, holes being cut for the eyes, nostrils, and mouth; on the mask a thin layer of linseed-meal poultice is spread, and on this layer some vaseline and iodoform; the mask is applied to the face, being renewed at least every two hours. In very severe cases the same application may be used for the eruption on other parts, but usually wet boracic-acid dressings will suffice.

When the crusts have separated, the ulcerated surface that is left should be treated by antiseptic dressings—boracic acid, iodoform and vaseline, or carbolic oil (1–20). Tense and deeply-seated pustules, such as are found where the skin is thick, should be opened with a lancet or stout needle, and treated aseptically.

Baths may be given at any stage of the disease, but are particularly useful during the eruptive period, especially when pustulation is taking place. The temperature of the bath will depend upon the object for which it is given. In severe, confluent cases, the continuous warm bath is of great value.

R. Denman has found, in a recent epidemic in Mauritius, that intravenous injections of electrargol were apparently of great value in severe cases. The dose is 10 c.c., increased later to 30 c.c., every twenty-four hours.

During the eruptive stage the nurse should be very careful not to give the patient any pain or discomfort when she is moving him. For instance, when raising the head and shoulders, her arm should be placed under the pillow. The bed should be soft, and the linen fine and light. A water bed should be used when the eruption is profuse.

In the nursing of delirious patients incessant watchfulness is essential. They will endeavour to escape from door or window if the slightest opportunity is afforded, and if actively restrained will become angry and violent, and attack the nurse or attendant in order to free themselves. Opium is the best drug for this condition; but in some cases other hypnotics or sedatives are more suitable. At times, however, even large doses of these drugs fail, and then the nurse must exercise all her tact in humouring the patient as much as possible: for instance, if he insists on getting up, she may allow him to walk about the room in dressing-gown and slippers; he will, in most instances, quickly become fatigued and be glad to return to bed. In some cases a male attendant will be necessary.

Complications must be treated as they arise. For laryngitis the patient should be placed in a steam tent. If there is serious laryngeal obstruction, tracheotomy will be necessary. The swelling of the tongue usually yields to ice; but if it be extreme, an incision should be made in each half of the organ. When there is much eruption on the mucosa and the palate, pharynx, mouth, and nose, these passages must be frequently washed out with one of the solutions mentioned in the articles Diphtheria and Scarlet Fever.

It is most important to pay attention to the eyes, which should be examined daily. They should be frequently bathed with boracic lotion to prevent the lids from sticking together with dried secretion. Vaseline should be smeared on the edges of the lids. Should ocular complications, such as severe conjunctivitis, keratitis, corneal ulcer, and the like, arise, they must be treated in the usual way.

Abscesses must be freely opened and drained.

In hæmorrhagic small-pox nothing can be done except to relieve symptoms and administer stimulants; but full doses of turpentine and ergot may be tried.

In discrete and confluent small-pox the patient may be allowed to get up daily as soon as his strength permits; but in very mild cases he needs to remain in bed only for a day or two.

No patient should be considered free from infection until all scabs have separated and ulcers have healed.

Quarantine period: fifteen days. *E. W. Goodall.*

SNAKE-BITE.

Those who are called upon to treat cases of bites from poisonous snakes should have some knowledge of the properties of snake venoms and antivenomous serum; and for this reason, before describing treatment, it is necessary to call attention to the leading facts connected with venoms and antivenomous serum likely to prove of practical assistance in carrying out treatment.

Snake Venoms.—Venomous snakes are divided into two main classes, viz., poisonous *Colubridæ* and *Viperidæ*. These two classes differ in appearance and also somewhat in structure; but, in addition, there are marked differences in the properties and toxic action of their venoms.

As an example of these differences, I may mention that a person bitten by the Indian cobra (*Naja tripudians*), and receiving a non-lethal dose of venom, gets well after a longer or shorter period of time (depending on the amount of venom he received) and with little or no local symptoms; on the other hand, a person bitten by the Indian daboia (*Daboia russelli*) and receiving a non-lethal dose, after getting over the general effects of the venom has an uphill fight to overcome the local effects, such as œdematous sloughing, etc., in the vicinity of the bite. In the former case the local action of the venom is a negligible quantity; in the latter it is a prominent symptom. These two snakes are types of the poisonous *Colubridæ* and *Viperidæ* classes.

The poisonous properties of a venom depend not on a single toxin, but on several, which differ widely in their action; and the symptoms produced by venoms depend on the proportionate amount and variety of the different toxic constituents which they contain.

The toxic elements of snake venoms are always associated with proteids, but as yet it has not been possible to separate them from the proteids with which they are associated; for these reasons they are looked upon as poisonous proteids or modified proteids in solution.

Some of the toxins have been separated from one another by various means such as heating, filtration through a gelatin filter, digestion with red blood-cells in the presence of heated serum, shaking a solution of venom with lecithin dissolved in chloroform, and by several other ingenious devices; but all separations have been in the form of toxic proteids.

The principal toxic proteids which make up the poisonous components in snake venoms are: *neurotoxins*, or toxins which act on nerve-cells, and of these there are several kinds; *cytolysins*, or toxins which break up cells either at the seat of injection or elsewhere when absorbed, such as red blood-corpuscles, endothelial cells of blood-vessels, leucocytes, and tissue-cells of vital organs such as the heart, kidneys, and liver; *fibrin ferments*, or toxins which may cause intravascular clotting of the blood.

In addition to the above three classes of toxins there are several others, such as proteolytic ferments, and a substance which in small amount causes increased tone in cardiac muscle, and in larger amount brings the heart to a systolic standstill; it has also a somewhat similar action on the muscle of the arterial walls.

The components I have mentioned are not by any means a résumé of every toxic substance in venoms; there are others not yet fully investigated. No venom thus far examined contains all these toxic constituents, but all venoms contain neurotoxins in greater or less amount, and most of them contain one or more cytolysins.

Venoms of the *colubridæ* class—especially the Indian cobra—are rich in neurotoxins and poor in cytolysins; whereas venoms of the *viperidæ* class—especially the Indian *Daboia russelli*—are rich in cytolysins and, generally speaking, poor in neurotoxins. This rule holds good to a greater or less extent for all species of the two classes of poisonous snakes, and is illustrated by the examples given above of the effects of non-lethal doses of cobra and *Daboia russelli* venom.

As the toxins of venoms are always associated with proteids in solution, their toxic properties can be rendered inert by any reagent which precipitates proteids in an insoluble form, such as the chlorides of gold or platinum, nitrate of silver, nitric acid, ammonium sulphate to saturation, permanganate of potash, solutions of the hypochlorites such as hypochlorite of lime, absolute alcohol in excess. The action of some of these reagents indicates their application as local remedies likely to be of use when brought into contact with venom at the seat of the bite, and before it has had time to become absorbed. Unfortunately venoms are absorbed rapidly, a circumstance which leaves only a brief period in which benefit may be derived from local remedies. Prolonged heating renders venoms inert, and the higher the temperature the more quickly this is accomplished. When solutions of venoms are subjected to a temperature of from 70° to 80° C. for fifteen to twenty minutes, the proteids coagulated at this temperature are thrown down, and with them the toxins with which they are associated. When cobra venom is treated in this way, only a comparatively small amount of proteid is coagulated and the filtrate still retains most of the poisonous properties of the untreated venom; similar treatment applied to *Daboia russelli* venom, and to some other venoms of the viper class, coagulates a considerable amount of proteids, and the filtrate will be found to have lost most of its poisonous properties. This would point to the cytolysins of a venom being associated with proteids coagulated at a low temperature (70° to 80° C.).

Antivenomous Serum (Antivenin).—When animals are highly immunized with snake venom, they furnish a serum which is an antidote for the venom used, but not for other venoms. Horses are the animals generally used for the preparation of antivenomous serum; they should be young, healthy, and in good condition. When venoms are collected they are dried, sealed up in glass tubes or bottles, and screened from light; in this form they retain their toxic properties unimpaired for a great number of years, and when required for experiments or for immunizing purposes they can be readily dissolved in water or normal saline solution. A 1 per cent dilution in normal saline is a convenient form in which to use venom for conferring immunity. Horses require to be systematically treated with gradually increased doses, given hypodermically, and

for a period of from twelve to eighteen months, before the serum is sufficiently potent to be used for treatment purposes.

When immunity is brought about by using a mixture of two or more venoms, the serum has a neutralizing effect on the venoms used, and is known as a polyvalent antivenomous serum, but polyvalent only for the venoms used in its preparation.

It is unfortunate that antivenomous serum is specific only for the venoms used in its preparation, and still more unfortunate that the venoms of the poisonous snakes differ so widely in their composition. In the circumstances, the preparation of a polyvalent antivenomous serum, efficacious in bites from all poisonous snakes, is hedged round with almost unsurmountable difficulties. What are these difficulties, and how can some of them be overcome? It would not be possible from a practical point of view to immunize an animal against 20 or 30 (probably more) different kinds of venoms, and an antivenomous serum polyvalent to that extent may therefore be ruled out of the question. Moreover, the collection of sufficient venom from all the varieties of poisonous snakes is in itself no small difficulty; and it is questionable whether it would be possible to obtain venom from some species in sufficient quantities for the immunization of large animals. It is also evident that a supply of specific serum for each kind of poisonous snake would be beset with the difficulty of selecting the serum to use when the species of snake which inflicted the bite is unknown, as happens in many cases.

The only practical solution (or rather partial solution) of the problem is, for countries infested with poisonous snakes to prepare their own antivenomous serum, and to prepare a polyvalent serum against the venom of the commonest and most deadly snakes of the country. In India antivenomous serum is prepared by immunizing horses with a mixture of cobra and *Daboia russelli* venoms, as these two snakes are responsible for most of the deaths from snake-bite in the country; the serum is an antidote for both.

TREATMENT.

Snake venom is rapidly absorbed when injected into the tissues; hence, treatment can only be successful when carried out early and efficiently; for this reason it should be designated *First-aid treatment*. The objects aimed at are:—

1. To prevent absorption of the poison. This is best done by the application of a proximal ligature when possible, as happens when the bite is on a limb. A tightly-applied ligature is likely to prevent the absorption of whatever venom may be still remaining at the seat of the bite, but it will only prevent it for as long as it is kept on.

2. To get rid of some of the venom at the seat of the bite—the whole of it if possible. This is best accomplished by incisions into the seat of the bite, and rubbing in crystals of permanganate of potash, or well swabbing out the wounds with a strong solution of this salt.

3. To neutralize the venom which has been absorbed. This can only be done by means of antivenomous serum. The serum should be given intravenously, and as soon after the bite as possible. When a specific serum is used in these circumstances its neutralizing properties on the venom in the circulation is brought into action at once, but when given subcutaneously valuable time is lost before the serum becomes absorbed.

The meaning of these three procedures is as follows:—

1. A ligature, when tightly applied around a part of the limb where there is a single bone, produces œdema and prevents absorption, but only for as long as it is applied; by this means we gain time for other treatment.

2. Incisions over the seat of the bite may allow some of the unabsorbed venom to flow out with the blood and lymph from the wounds. Permanganate of potash will neutralize the unabsorbed venom in the wounds provided it comes in contact with it.

By these means, and even without the use of antivenomous serum, a lethal dose of venom may in many cases be reduced to a non-lethal dose.

3. The antivenomous serum neutralizes the whole of the absorbed venom in the circulation, provided that it is specific, and is given early and in sufficient amount. When the serum is non-specific it is still best to give it, as it may have a neutralizing effect on some of the toxic constituents of the absorbed venom.

When a person is bitten by a poisonous snake he may receive one or other of the following doses of venom:—

1. A small non-lethal dose which may produce only slight symptoms.

2. A maximum non-lethal dose, which produces well-marked symptoms, and the bitten person only just escapes death.

3. A minimum lethal dose, which causes death after a more or less prolonged interval.

4. A lethal dose only slightly more than the minimum.

5. A lethal dose sufficient to cause the death of two or more persons.

Those who receive a non-lethal dose recover irrespective of treatment, but when treated early and efficiently, especially with a specific antivenomous serum, the symptoms are likely to be less severe and recovery more rapid.

Those who receive a minimum lethal dose require only a little help to enable them to recover. A specific antivenomous serum, given early and intravenously, invariably saves the situation in these cases; but early application of a ligature and early local treatment may also reduce a minimum lethal dose of venom to a non-lethal dose.

The same line of reasoning applies to those who receive a lethal dose which is only a slight increase on the minimum lethal; early and efficient local treatment and the intravenous injection of specific antivenomous serum would be likely to prove successful. The most difficult cases are those which receive a large dose of venom, such as several lethal doses. It is questionable whether treatment of any kind can be given in time to save such cases. Even with a specific antivenomous serum, and given intravenously, the dose would have to be a large one, from 50 to 100 c.c., and given early.

In such a case, where the snake bites into a vein and injects the venom intravenously, death takes places in a few minutes. I have in my mind a native servant in India who was bitten on the leg by a cobra; he gave a shout which attracted some people who were near, then became collapsed, and died in a few minutes. There were two puncture marks made by the cobra's fangs immediately over an enlarged vein of his leg. The cobra, which was about 5 ft. in length, was found and killed. This was undoubtedly a case in which the venom was injected intravenously, and where there was no time for treatment of any kind.

In animal experiments, a dose of venom which kills an animal of a certain weight in twenty minutes when given intravenously, requires two hours to kill a similar animal of the same weight when given subcutaneously. In dogs and rabbits, when several lethal doses are given intravenously, death takes place immediately.

In all cases of bites from poisonous snakes it is best to act on the assumption that a lethal dose of venom has been given, and to take immediate steps to counteract its effects. The object in view is to reduce a lethal to a non-lethal dose, and to bear in mind the means by which this object may be attained.

Permanganate of potash is probably the best of the local applications to rub into the incisions over the seat of the bite; in any case it is more likely to be available than other remedies, such as chloride of gold or freshly-prepared solutions of hypochlorite of lime. A ligature has generally to be improvised on the spur of the moment; it matters little of what it is made as long as it prevents the return of the circulation; it should not be kept on longer than half an hour, after which it may be loosened slowly and re-applied if necessary.

When antivenomous serum is available it is best, for the reasons stated, to give it intravenously. A vein of the forearm or at the bend of the elbow is generally selected; when it is raised by pressure applied above, there is no difficulty in introducing the needle, provided the syringe is held almost parallel with the vein, and the oblique opening at the point of the needle uppermost; the serum should be injected slowly and in the direction of the circulation. At least 20 c.c. of serum should be given; but when symptoms are pronounced it is advisable to give more, even up to 80 or 100 c.c. It is questionable whether cases which would require more than 50 c.c. of serum to neutralize the venom which a large snake might inject would live long enough after being bitten to allow of any treatment being carried out.

It sometimes happens that there is a flocculent deposit in the bottles of serum; when this is the case it should be quickly filtered through a clean piece of linen or handkerchief into a clean vessel before being filled into the syringe. Any air in the syringe should be got rid of before injecting the serum into a vein.

There is a difficulty in giving the serum intravenously when treatment is carried out by lay people, which often happens in the tropics. A bungled attempt at intravenous injection would really mean a badly-given hypodermic injection, and at a site where absorption does not take place so rapidly as at some other parts of the body. In these circumstances it would be best to give the serum hypodermically and into the cellular tissue on the side of the abdomen.

It is a mistake to dose patients with a large amount of alcohol, or to walk them about with the idea of keeping them awake and rousing them up. The stimulant effect

of small doses of alcohol may be beneficial, but the same ends can be obtained by ammonia and strychnine. Hot coffee or hot tea may do some good; quietness and warmth are indicated.

The severe local reactions, such as swelling and possibly gangrenous sloughing, in the vicinity of the wound which sometimes follow the bites of certain species of the *Viperidæ* (including the English viper) should be treated on general principles. *D. Semple.*

SPAS.—(*See* HEALTH RESORTS.)

SPASMUS NUTANS.—(*See* NYSTAGMUS.)

SPECIFIC THERAPY (Bacteriotherapeutics).

SUMMARY.

A.—GENERAL.—1. Definition. 2. Scope. 3. Toxins and antibodies. 4. Passive and active immunity: sera and vaccines. 5. Antitoxin and bactericidal sera. 6. Vaccines. 7. Sensitized vaccines. 8. Choice of remedies. 9. Preparation of sera. 10. Preparation of vaccines. 11. Preparation of sensitized vaccines. 12. Mode of administration of sera. 13. Mode of administration of vaccines. 14. Non-specific effects of sera: serum sickness: anaphylaxis. 15. Immediate effects of vaccines. 16. Prophylactic use of sera and vaccines: typhoid fever, influenza, 'colds'. 17. General remarks on inoculation treatment.

B.—SPECIAL.—

1. DISEASES TREATED BY SERA.—Diphtheria; Tetanus; Streptococcus and pneumococcus infections; Anthrax; Cerebrospinal fever.

2. DISEASES TREATED BY VACCINES:—

Streptococcus Infections.—Erysipelas; Cellulitis; Acute abscess; Pyorrhœa alveolaris; Septicæmia; Infective endocarditis.

Pneumococcus Infections.—Pneumonia; Empyema; Bronchopneumonia; Bronchitis; Asthma; Infections of upper air-passages; Septicæmia.

Staphylococcus Infections.—Chronic local infections (boils, carbuncles, sycosis, acne, otitis media, eczema, etc.); Acute local infections; Pyæmia; Osteomyelitis.

Gonococcus Infections.—Acute and chronic urethritis; Gonorrhœal rheumatism and iritis.

B. Coli Infections.—Urinary tract infections; Post-operative suppurations; Colitis.

Tuberculosis.

A.—GENERAL.

1. Non-specific and Specific Treatment of Infective Disease.—The treatment of patients suffering from diseases due to infection by micro-organisms may be considered under two heads: (1) *Non-specific treatment;* and (2) *Specific treatment.* Non-specific treatment includes all those measures which are not directly concerned with the causal microbe, but which tend to increase the general well-being of the patient, such as fresh air, rest, food, hydrotherapy, eliminative drugs, etc. Specific treatment includes all measures directly concerned with the destruction of the causal microbe, the inhibition of its growth, and the neutralization of its poisons, such as the use of immune sera, vaccines, etc. The distinction as thus drawn is not, of course, an absolute one. Certain drugs have a specific effect upon the causal microbes of disease (quinine in malaria, mercury and arsenic in syphilis), so that it is necessary further to limit the definition of specific therapy by stating that the measures spoken of act by assisting the natural mechanism of immunity.

Until recently, the treatment of infective diseases was almost wholly non-specific. With the discovery of pathogenic microbes, and with the rapid growth of bacteriology there has sprung up a system of specific therapy which has already proved of great value in certain diseases, and which promises to be equally so in many others. The link between the study of bacteria as the causal agents of infective diseases, and specific therapy, is the science of immunity, or the study of the mechanism of resistance by the body to microbic infection. In this science of immunity a large number of workers are constantly engaged correlating the results of laboratory experiments with clinical observations. Although many important gaps in this science remain to be filled, a great mass of facts has been collected whereby a rational attempt can be made to combat disease due to bacterial infection.

2. The Scope of Specific Therapy.—Strictly speaking, accurate knowledge both of the bacteriology and the immunity of each particular infective disease is necessary before its specific therapy can be completely successful. But in this respect there is a fundamental

difference between the two necessities. The bacteriology of the disease is an absolute necessity, the exact knowledge of the mechanism of its immunity is only a relative necessity. The pathologist is absolutely dependent upon the isolation of the causal microbe to produce whatever therapeutic agent he wishes to employ. He is not absolutely dependent upon knowing the steps in the immune process; the very trial of the remedy may further his knowledge of the mechanism of immunity as operating in the particular disease he is studying. In relation to specific therapy, microbic diseases fall into three groups. In the first group no specific treatment can be adopted, because the causal agent is unknown: such diseases are measles, mumps, varicella. In the second group of diseases the causal agent is known, and this knowledge admits of the preparation of specific remedies and of their use: such diseases are diphtheria, tetanus, anthrax, plague, cholera, typhoid fever, Malta fever, pneumonia, streptococcus, staphylococcus, and gonococcus infections, etc. In the third group of diseases, although the causal agent is not known with certainty, specific therapy, though highly experimental, is at times undertaken because these diseases have affinities with others of which the causal agents are known. These affinities are perhaps concerned with certain common complications of the diseases proper: such diseases are scarlet fever, rheumatic fever, influenza, and pertussis.

3. **Toxins and Antibodies.**—In all diseases of bacterial origin, the disease-process is due to the operation of the specific poisons incidental to the life of the bacteria (*toxins*). Toxins are of two kinds: those produced in the medium in which the bacteria thrive (*exotoxins*), and those existing in the bodies of the bacteria and set free by their disintegration or solution (*endotoxins*). Microbic diseases may be considered to be of two kinds, according as the poisons leading to the symptoms of the disease are chiefly exotoxins or endotoxins. Diseases of the first kind are tetanus and diphtheria; of the second, cholera, typhoid fever, and affections due to the pyogenic micro-organisms (streptococcus, pneumococcus, etc.).

It will not be necessary in this article to go even superficially into the theories as to how immunity to bacterial diseases is acquired naturally. It seems certain that the invasion of the body by living bacteria leads to the production of a series of protective substances (*antibodies*) of highly complex nature, which act beneficially as regards the tissues. This beneficial action is either exerted by neutralization of the exotoxins (*antitoxins*), by direct destruction of the bacteria (*bacteriolysins*), or by stimulation of the leucocytes to phagocytosis (*opsonins*). Specific therapy has as its object the artificial increase of these antibodies.

4. **Passive and Active Immunity: Sera and Vaccines.**—The above object may be obtained in two very different ways: the patient may be supplied with ready-made antibodies, or he may be induced to manufacture his own antibodies on a larger and more efficient scale than he is already doing. To supply ready-made antibodies is to confer *passive immunity;* to stimulate the manufacture of antibodies is to produce *active immunity*. The method of conferring passive immunity most commonly in use is the employment of *immunized serum* derived from animals (e.g., the horse). The method of producing active immunity most commonly in use is the employment of *bacterial vaccines*. These two methods may be combined in the treatment of certain diseases. Together, they almost cover the present range of practical specific therapy; they are therefore the two methods with which this article chiefly deals.

5. **Antitoxin Sera and Bactericidal Sera.**—Immunization by the use of specially prepared sera is of two kinds—immunization against bacterial exotoxins and immunization against the bacteria themselves. It follows from what has already been said about exo- and endotoxins that in those diseases in which the symptoms are chiefly due to exotoxins (e.g., diphtheria), the desideratum is a serum rich in antitoxin; such a serum is termed an *antitoxin serum*. Again, in those diseases in which the symptoms are chiefly due to endotoxins (e.g., streptococcal infections), the desideratum is a serum rich in bactericidal substances; such a serum is spoken of as *bactericidal serum*. Antitoxin sera are produced by the injection into suitable animals of exotoxins in increasing quantities until the blood-serum possesses a high antitoxin content. Bactericidal sera are produced by the inoculation of suitable animals with killed or with living bacteria in increasing numbers, or with bacteria of increasing virulence, until the blood-serum possesses a high bactericidal content.

6. Bacterial Vaccines.—By the term bacterial vaccine is meant a suspension of micro-organisms in some neutral medium such as isotonic ('normal') salt solution. To such a suspension the word '*vaccine*' has come by common consent to be applied. (For the material used in small-pox prophylaxis the term '*lymph*' is more appropriate.). In preparing such a vaccine, the object aimed at is so to treat the micro-organism that it may be obtained in bulk and freed from exotoxin. A suspension of the bodies of the micro-organism so obtained in normal saline (the 'emulsion' as it is commonly called) is to all intents and purposes a preparation of the endotoxins of the micro-organism, together with the structural elements of the bacterial cell.

7. Sensitized Vaccine.—In some infective processes it may be advisable to employ both immune serum and vaccine. This conjoint use of both remedies may be undertaken in two ways: (*a*) Serum and vaccine may be injected independently into the patient; or (*b*) The vaccine may be submitted to the action of the immune serum before its introduction into the body; the result of this action is that the vaccine abstracts the specific antibody from the immune serum, with the production of what is termed *sensitized vaccine*. The use of sensitized vaccines is of recent introduction, and their employment is as yet in a very experimental stage.

To sum up, the available means of employing specific therapy to-day are:—

a. The use of *immune sera*: (i) *Antitoxin sera*, which chiefly act by neutralization of exotoxins formed by bacteria in the body; (ii) *Bactericidal sera*, which chiefly act by destruction of the bacteria, and thereby preventing the increase of endotoxins.

b. The use of *bacterial vaccines*, which serve to stimulate the natural mechanism of immunity.

c. The use of immune sera and vaccines conjointly, either as separate remedies or in the form of *sensitized vaccine*.

8. The Choice of Specific Remedies in Different Cases.—The choice of the particular remedy to be employed in any case of infective disease depends upon (*a*) The nature of the infection; (*b*) Whether it is local or general; (*c*) Its acuteness or chronicity, and (*d*) The stage at which the infection has arrived. These considerations will be discussed briefly as the various infective diseases are dealt with. Whilst still dealing with general points, however, let it be noted that there are two very important differences to be observed between sera and vaccines, fundamental differences arising out of their mode of action as already outlined: (i) Immune sera act rapidly, but their action is transient; vaccines act slowly, but their action is more prolonged; (ii) Immune sera supply important substances that are lacking in the body, and they probably do not require much active response on the part of the tissues in order to produce their effects; vaccines depend for their action upon a latent power in the tissues of producing antibodies when specifically stimulated to do so. There follow from these generalizations certain rough indications for the choice of specific remedies in any case in which a choice is possible. It may be said that *the more acute and generalized the condition, and the more ill the patient the more likely is immune serum to prove efficacious; the more chronic and localized the condition, and the better the patient, the more likely is a suitable vaccine to do good.* It is often advisable to begin the treatment of a severe case of infection by the immediate and liberal use of an appropriate serum, and to follow up any advantage thus gained by inoculation with a vaccine which has been prepared in the meantime.

Before proceeding to deal with the various infective diseases in which specific therapy has proved of service, there remain to be discussed certain general points, such as the preparation of sera and vaccines, their standardization, the methods of their administration, and the local and general effects of their use other than effects directly connected with the disease-process. Only those points which bear directly upon treatment will be dealt with.

9. The Preparation and Standardization of Immune Sera.—

a. Antitoxin Sera.—These are prepared by injecting the exotoxins of bacteria into healthy horses in gradually increasing amounts. The horses are carefully chosen and are proved by the mallein test to be free from glanders. In the case of diphtheria the strength of the exotoxin used for the inoculation is ascertained by estimating its lethal effect upon guinea-pigs of standard weight. The progress of the horse's immunization to the exotoxin is tested from time to time, and when this has reached a satisfactor

point, the horse is bled to the extent of several litres. The blood, collected with sterile precautions, is allowed to clot, and the serum which separates out constitutes the 'antitoxin' required. This antitoxin serum is tested for sterility and for absence of exotoxin, and is then standardized. The present methods of standardization of diphtheria antitoxin are the outcome of an original method which turned upon the choice of an arbitrary 'unit' of antitoxin introduced by Behring. This unit was the amount of antitoxin necessary to neutralize 100 times the minimal lethal dose of exotoxin for a guinea-pig weighing 250 grm. In the case of tetanus antitoxin, standardization is achieved on somewhat similar lines, the 'unit' having reference to an amount of exotoxin lethal to a given weight of mice. The strength of the antitoxin sera being ascertained, they are put up in hermetically sealed phials, usually protected from bacterial contamination by the addition of a minute amount of some antiseptic, such as tricresol.

b. Bactericidal Sera.—These are prepared in a very similar manner, but the horses are inoculated with the bacteria themselves (endotoxin) instead of with their chemical products. In the case of the bactericidal serum most often used—antistreptococcus serum—various methods have been employed from time to time to secure a potent remedy. One is to inject cocci whose virulence has been raised by passage through susceptible animals. Another is to use cocci derived directly from the human host, without loss of virulence by sub-culture. The matter is complicated by the fact that the genus streptococcus has various types, just as the genus *B. coli* has, and a serum immunized against one type is not necessarily immunized against another. This difficulty was thought at one time to be solved by inoculating the same horse with a large number of different strains of streptococci. The resulting 'polyvalent' serum has become very popular, but more so perhaps on account of the notion underlying its preparation than on account of practical results. This question will be considered more fully in dealing with streptococcus infections. No efficient means of standardization of bactericidal sera has yet been evolved, because as yet there is no definite knowledge of the nature of the active principles present in the serum. Even the idea that the essential ingredient is a bactericidal substance is based upon slight evidence; certainly no such substance can be estimated with any degree of accuracy. Of late years, with the growing popularity of vaccines, it has been suggested that when a serum does good it does so by virtue of opsonins present in it; but of this there is as little evidence as that its efficacy is due to bacteriolysins or antitoxins. Bactericidal sera are usually put up in phials containing 10 and 25 c.c., the same precautions being used as in the case of antitoxin sera.

10. **The Preparation and Standardization of Bacterial Vaccines.**—The first step is to isolate in *pure culture* the causal micro-organism of the disease to be treated. This is essential to success, and is a desideratum without which no therapeutic argument in regard to vaccines can be sound. The method of achieving this desideratum will depend upon whether the infection is local or general. (*a*) If a local lesion is to be dealt with, a portion of the exudate, secretion, or tissue concerned is obtained, as free as possible from contaminations, and is forwarded promptly in a sealed sterile vessel to the pathologist. If the practitioner has culture tubes by him he may make his own cultivations, and forward the inoculated tubes to the pathologist. In some instances this is almost imperative; thus, in a case of pyorrhœa alveolaris it is necessary to clean the surface of the gum thoroughly, and to inoculate an agar slope with a little of the pus which is squeezed out from the pocket lying between the gum and the tooth. (*b*) In the case of a patient suffering from a general blood infection without a local lesion, a blood-culture must first be made, care being taken that a sufficient quantity of blood (not less than 5 c.c.) is removed with the proper technique.

In most cases the infection is by a single micro-organism; sometimes, however, the infection is mixed, in which case a vaccine may be prepared from the various micro-organisms separately. The bacteriologist will only prepare his vaccines from pure cultures. The colonies of growth are collected together, scraped off the surface of the medium, and transferred to a measured bulk of salt solution so as to form a uniform emulsion, which is then sterilized by being heated to 65° C. for an hour. Standardization is effected by actually counting the micro-organisms by the aid of a Thoma-Zeiss pipette, as used for blood-counts. The vaccine is then so diluted as to yield appropriate doses per c.c. (e.g., 5, 10, 100, 1000 million per c.c.), and is transferred to small glass ampoules,

which are sealed in the blowpipe flame; or it is sent out as a 'stock' solution (e.g., 100 or 1000 million in 1 c.c.) in small bottles with paraffined rubber tops, which can be pierced by the hypodermic syringe needle as necessary. The greatest care is exercised, in preparing the vaccine, to observe the principles of strict asepsis combined with accuracy.

11. **The Preparation and Standardization of Sensitized Vaccine.** — Sensitized vaccines are made in the following manner. An emulsion of the micro-organism is prepared as in the case of an ordinary vaccine, by obtaining a uniform suspension of the elements in saline solution. The strength of the emulsion is determined by the method of counting already described. This emulsion is now brought in contact with the appropriate immune serum, and the mixture is allowed to stand at the room temperature for twelve hours. At the end of this time the micro-organisms will be found to be deposited as a sediment at the bottom of the tube. The serum is now pipetted off and more saline is added. The tube is then centrifuged until the micro-organisms have again sedimented. The process of pipetting and adding saline is repeated, so that all traces of the serum are removed. The result is an emulsion of the bodies of the micro-organism in saline, with the specific antibody of the immune serum attached to them (Besredka).

The process of manufacture of sensitized sera is not difficult; but certain practical points are important. (*a*) The serum must contain a definite antibody to the micro-organism used. (*b*) As little antibody should be used as is compatible with sensitization. (*c*) The whole process should be completed in one day (M. H. Gordon).

The micro-organisms may be killed after this process of sensitization, or the emulsion may be used without this safeguard.

12. **The Mode of Administration of Immune Sera.—**

a. By Subcutaneous Injection.—This is the method most often chosen. The procedure is extremely simple. The skin of the flank is prepared by being well washed with soap and water and subsequently rubbed with cotton-wool soaked in acetone or absolute alcohol. An all-glass serum syringe, which has meanwhile been boiling in water, is fitted with a clean and sharp needle, also boiled, and the serum is taken up into the syringe directly from the phial. Air is expelled from the syringe, and the contents are injected into the subcutaneous tissues. It is important to make certain that the point of the needle is quite free in the loose cellular tissues, and that it has not re-entered the deep layers of the skin at a point remote from the puncture. This fallacy is not at all uncommon, and is due to the pinching up of too narrow a fold of skin. As a matter of fact it is scarcely necessary to pinch up a fold of skin at all; the injection is less painful if the needle is inserted into almost flat skin, kept slightly stretched by the finger and thumb held about two inches apart. The serum is injected *slowly*: the injection of 10 c.c. should occupy quite a minute. If this direction is followed, and if the needle is clean and sharp, the discomfort to the patient is quite trivial. It is sometimes advisable to give a large quantity of serum—as much as 50 c.c.; it is then a good plan to put half the quantity into each flank.

b. By Intravenous Injection.—This method is indicated in cases of very severe infection, or when for any reason the application of the remedy has been delayed. It is perhaps adopted less often than it should be. It requires care and strict cleanliness, but with these precautions it is quite free from risk to the patient. It is advisable to dilute the serum by at least four times its bulk of normal saline. The skin over the vein at the bend of the elbow is well washed and treated as above mentioned. The piston of the syringe must not be quite at the top of the barrel, because it is necessary to allow a little blood to run into the neck of the syringe to prove that the needle is in the vein. When the syringe is ready, the arm is bandaged well above the elbow, and is allowed to hang out of the bed fully extended. The most prominent vein is chosen and is punctured. If blood oozes into the syringe when the piston is gently withdrawn, the serum is slowly injected. If no blood oozes into the syringe, the needle is withdrawn a very short distance to ensure its point not being in the wall of the vein on the side opposite the puncture. On no account must the serum be injected until proof is forthcoming that the vein has actually been entered. When the serum has been injected, the needle is withdrawn and the operator's finger is placed against the puncture whilst the arm is raised and the bandage removed.

c. Per Rectum.—Sera are often given per rectum, but this route is usually chosen

because it is assumed that the subcutaneous route entails pain and distress. Immune sera are often prescribed for non-specific purposes (e.g., antistreptococcus serum in gonorrhœal rheumatism, etc.), and it may be that their administration per rectum is in these circumstances fraught with some virtue not as yet understood. But if the indication for the use of an immune specific serum is definite, it should be given in one of the two ways already described.

d. By Intrathecal Injection.—This route is chosen in cerebrospinal fever and in other forms of meningitis. It is also chosen as a desirable route in tetanus. By lumbar puncture an amount of cerebrospinal fluid equivalent at least to the amount of serum to be injected is run off, and the serum is either injected very slowly, or is allowed to flow in by gravity, *the serum being warmed to body-heat before it is used.* The patient's shoulders are inclined downwards, and maintained in this position for about one hour after the injection.

13. **The Mode of Administration of Vaccines.**—The common mode of administering vaccines is *by subcutaneous injection.* For patients in bed the region of the flank is most convenient; for those who are not in bed the lateral aspect of the upper arm is best. There is some reason for thinking that the introduction of the vaccine near the seat of a local lesion is of advantage. As to the exact depth to which the needle should be inserted to get a better result, whether into the subcutaneous tissues merely, or into the muscle, there is no knowledge to serve as a guide. Less discomfort appears to follow subcutaneous than intramuscular inoculation, and this fact may well determine the matter for the present. The skin is prepared as in the case of serum injections, and the same precautions are observed in regard to the syringe and needle. The ampoule is well rolled between the hands to ensure uniform suspension of the bacteria, which may have formed a sediment on standing. If the ampoule has a wide neck it is necessary to tap the shoulder of the ampoule sharply several times in order to get the fluid in the neck well below the file mark or the constriction. The neck is then broken off, and the contents are taken up into the syringe. The mode of injection is the same as in the use of sera. No dressing of any kind is necessary to cover the puncture.

Some authorities administer tuberculin vaccine *by mouth*, and recommend this route. It is perhaps of service in little children. If given in this way, the vaccine is mixed with a convenient bulk of normal saline solution, and is swallowed at a time when the stomach is thought to be empty. Considering the small bulk of the vaccines as usually prepared (1 c.c.), and the fact that their subcutaneous injection is free from more than trivial discomfort, it seems desirable at present to continue this method of administration, as tending more easily to accuracy of observations in regard to results. Moreover, there is experimental evidence that the specific activity of some vaccines at least (e.g., tuberculin) is destroyed by pepsin and trypsin. But it has been suggested recently that certain vaccines may have better effects if given by this route than by any other, on the ground that the tissues of the alimentary tract are those which are chiefly susceptible to the particular infecting agent. On this principle it is thought that typhoid vaccine may well be administered per os.

14. **Non-specific Effects of Serum Injections: Serum Sickness: Anaphylaxis.**—The introduction of a foreign serum into the tissues leads at times to a local and general disturbance which is a matter quite apart from the neutralization of toxins or the destruction of infecting bacteria. These effects are certainly not due to the presence of small amounts of antiseptics in the serum. The symptoms of 'serum sickness' usually appear about the period of the eighth to tenth day after the first dose. The commonest symptom is an urticarial rash, often most troublesome near the situation of the puncture, and sometimes confined to this situation. It may be accompanied by slight general œdema. Joint-pains are fairly common, often with slight swelling of the synovial membranes and stiffness of the joints. Albuminuria and adenitis are less common. A certain degree of fever is usually present if the other symptoms are at all marked. The treatment of this condition is entirely palliative. It is rarely serious. But if the joint affections precede the rash, some difficulty in diagnosis may arise.

Anaphylaxis.—It occasionally happens that patients who have received immune or normal horse (or other foreign) serum on some former occasion remain 'sensitized' towards foreign sera generally. The further injection of serum may now give rise to a

sudden series of nervous symptoms, such as headache, vomiting, rapid pulse, dyspnœa, tremors, cyanotic pallor, and in a few cases convulsions and coma. In a very few cases death has occurred. The interval between the last dose of serum and the dose producing such symptoms varies from a few days up to several years. The symptoms are less prone to develop if the subsequent serum be given intravenously or intrathecally than if given subcutaneously. In ordinary practice the possibility of these anaphylactic symptoms occurring is often wholly disregarded ; but as it is quite a simple matter to test the patient for his degree of sensitization, this should be done in all doubtful cases. A minute dose of the serum to be used is injected *into* (not under) the skin by means of a fine needle. That the injection is being made intradermally is best assured by observing that the point of the needle produces slight dimpling of the skin ; it is better to pierce the skin completely and then to make the needle re-enter the deep layer of the skin from below, than to attempt to insert the needle to the requisite depth in the first instance. The effect of the injection of (say) 2 to 3 minims of the serum in this situation is to produce a small blanched area immediately above it. In proportion as this area is marked, and accompanied by wheal formation, so is the degree of the patient's liability to anaphylaxis. If it is concluded that this liability is definite, the patient is *desensitized* by the preliminary injection of (say) 0·5 c.c. of the serum an hour before the main dose is given. Or it may be decided, even after this effort at desensitization, to administer the serum intravenously.

15. **The Immediate Effects of Vaccine Inoculation.**—

a. Local Effects.—There is no uniformity of opinion as to how little or how much local 'reaction' should be aimed at when a vaccine is used therapeutically. When given for prophylaxis (e.g., *B. typhosus* vaccine against typhoid fever), a local reaction is anticipated. In treatment, however, it is not certain that any definite reaction at the site of inoculation is necessary in order to get good effects. The degree of this reaction is probably directly proportional to the amount of the dose, and also to the virulence of the bacterial endotoxin. Unfortunately there is at present no standard of virulence of bacterial endotoxins. Different strains of the same micro-organism differ much in virulence, and a virulent strain is apt to lose its potency, it may be very quickly, on subculture. For these reasons it is a matter of great difficulty to anticipate the degree of reaction which a vaccine of known strength as regards the number of bacteria it contains will produce. The principle of practice with most workers appears to be that in cases of chronic and of local infection a mild but definite reaction is aimed at, but in cases of acute and of general infection no reaction is sought. By a 'mild but definite' reaction is meant as follows : From four to eight hours after the introduction of the vaccine a tender spot appears, surrounded by a small area over which the skin presents a faint blush. Slight swelling is also present, and this extends somewhat beyond the redness. The affected area is tender, and there is slight stiffness of the limb on movement. After eighteen to twenty-four hours, the inflammation begins to subside, leaving only a tender spot, with slight thickening of the subcutaneous tissues. After forty-eight hours all these effects pass away. A dose which is unnecessarily large for its purpose, or which is very highly toxic, produces a more marked reaction, and may lead to redness and swelling of a large part of the arm, and much attendant discomfort. It cannot be said that if no reaction at all occurs the dose used has been too small for its purpose. Care in the choice of the dose will almost always suffice to prevent an undue reaction ; and this care should be exercised in every case, seeing that such extreme reactions rarely, if ever, appear to have any therapeutic benefit which may not be obtained without them. It happens quite often that such a moderate reaction as that just described follows the first of a series of doses of vaccines, but is not seen after subsequent doses, even when these are increased in size. After the injection of tuberculin (T.R.) in the therapeutic doses usually given nowadays, no reaction at all is to be expected.

b. General Effects.—After the inoculation of a prophylactic dose of vaccine, when, as is the rule, a large dose is chosen, there is usually set up a fairly marked general disturbance : headache, lassitude, pain in the limbs, and a rise of temperature to 100° to 102°. These symptoms come on a few hours after the injection, and subside during the second twelve hours. After the initial therapeutic dose in chronic infective processes, nothing so severe as this occurs ; but there is often a feeling of slight malaise during the

day following the inoculation. In some cases the patient complains of nervous irritability, in others of drowsiness. After the initial dose, even if the number of micro-organisms be increased, it is unusual to see any such general effects. With the small doses chosen in the treatment of acute and generalized infective processes, no constitutional disturbance supervenes. In chronic and local infective processes, even if there be slight initial disturbance, this is often followed by a state of general invigoration, in some cases quite marked.

16. The Prophylactic Use of Immune Sera and Bacterial Vaccines.—

a. Immune Sera.—Diphtheria and tetanus are the two diseases in which immune sera are sometimes administered for preventive purposes. In the former disease, at all events, there is evidence that a prophylactic dose of antitoxin is of definite service in protecting against infection for a period of some days. Questions of dosage will be discussed later.

b. Bacterial Vaccines.—In preventive medicine, the principle of inoculation has been applied on a large scale to *plague*, *typhoid fever*, *cholera*, and *bacillary dysentery*. More recently a good deal of experimental work of a similar kind has been attempted in *influenza*. In each of these diseases a certain amount of active immunity appears to be conferred by specific inoculation, and various methods of carrying out the principle are still on trial. Of late years a good many animal experiments have been made relative to the prophylactic use of vaccines, but much still needs to be done in this direction. The susceptibility of rabbits to infection by staphylococci and streptococci may readily be lessened by inoculation with moderate doses of vaccines prepared from these micro-organisms. This raises the important question whether a similar result may not be brought about in patients who are to be submitted to operations involving risk of pyogenetic infections afterwards, as in removal of the tongue, etc. Such protective vaccination has, indeed, been introduced into surgery, and is actually practised by a few careful surgeons. The inoculations should be made during the week but one preceding the operation. It is not uncommon for patients who have recently been inoculated on account of furunculosis or some other staphylococcal infection, to remark upon an unwonted freedom from suppuration when they incur some accidental damage to the skin or deeper tissues. It has been shown experimentally that rabbits enjoy a very high degree of immunity to the endotoxin of the meningococcus after prophylactic inoculation by killed cocci, and it is possible that children might with benefit be inoculated in a similar manner in the presence of an epidemic of cerebrospinal meningitis.

i. The chief use in England of prophylactic inoculation by killed bacteria is in connection with *typhoid fever*. Persons going into districts abroad where typhoid fever is endemic, especially if they are adolescent, and therefore at a susceptible age, are well advised to be thus inoculated. There is a growing mass of evidence that such vaccination confers a relative immunity which may last for several years. The inoculation should be completed at least one week before the person sails, so that the resulting malaise shall not increase any tendency there may be to sea-sickness. In order to lessen both the malaise and the local reaction at the site of inoculation, it is advisable to give the vaccine in two doses with a week's interval. The writer's own practice is to inject a dose of 1000 million killed bacilli, and to follow this, after an interval of seven or ten days, by a second dose of 2000 million bacilli. The vaccine is freshly prepared, and two or three different strains of typhoid bacilli are used in its manufacture. The first dose is conveniently given at such a time that the person inoculated can arrange to stay indoors and have little or nothing to do during the next day. The extent of the reaction differs considerably in different individuals; it is not usually sufficient to make lying in bed a necessity. It has generally passed off forty-eight hours afterwards. The second dose, though of double the size, usually produces a much slighter reaction than the first; this second dose may therefore be given as late as the day before embarking, or if the patient be a good sailor and the voyage is to last longer than ten days, this dose may be given on board. It should be remembered, however, that it is desirable to allow a clear fortnight to elapse between the second inoculation and the time of arrival at the district where typhoid fever is rife.

ii. Reference has been made to the use of bacterial vaccines before *surgical operations*. In operations involving technique of a prolonged kind, as in perineal abdominal excision

of the rectum for cancer, it is advisable to prepare the patient for the fortnight prior to the operation by prophylactic treatment with colon bacillus vaccine, or with this in conjunction with *Streptococcus fæcalis* vaccine. It may soon become a pertinent question whether it is not advisable to administer a prophylactic dose of *Streptococcus pyogenes* vaccine prior to every operation involving the opening of the peritoneum, when the necessary time can be allowed. It is true that sepsis is becoming less and less common with the modern surgeon's careful technique, but the occasional occurrence of general peritonitis after laparotomy is so disastrous an event, and is so constantly due to infection by *S. pyogenes*, that the question merits some consideration. It is, perhaps, well to use a sensitized vaccine in such cases, as it has been shown that the immunity thus produced is greater, and lasts longer, than that produced by a 'naked' vaccine. Moreover, the immediate toxic effect of the vaccine is in this way lessened.

iii. More recently attempts have been made to immunize persons against certain acute infective processes of a different class by means of inoculation. The infective processes referred to are *influenza*, *acute rhinitis* and *nasopharyngitis* (*common cold*), and various forms of *acute sore throat*. A few comments of a general kind may not be out of place in regard to it. When faced with the question as to the practicability of protective inoculation against *influenza*, the first consideration which arises is whether or not the causal microbe of uncomplicated influenza has as yet been isolated. Despite the claims made in this respect for Pfeiffer's bacillus, there remain several points lacking in the complete proof that this micro-organism is the *materies morbi* of the disease. It is quite possible that Pfeiffer's bacillus is only the most frequent of the various secondary infective agents common in the disease, and that the essential causal factor in the primary infection is unknown. If this be so, a close analogy exists, in respect of certain etiological points, between influenza and scarlet fever. For just as in scarlet fever the uncomplicated disease is usually a somewhat trivial affair, its common association with pathogenic streptococci rendering it oft-times very serious, so in influenza a sharp but short febrile attack, of itself not often very troublesome, may become of grave import when complicated by other infections. In addition to Pfeiffer's bacillus, the pneumococcus and *M. catarrhalis* are perhaps the most common micro-organisms found in association with influenza. It follows from this argument that when a person is 'immunized against influenza' by inoculation with *B. influenzæ*, there is a large presumption underlying the treatment. But such experiment, if carried out on a large scale upon susceptible persons, would be very valuable. It appears to be the custom of some 'immunizators' to inoculate 'against influenza' by a mixture of vaccines derived from Pfeiffer's bacillus, pneumococcus, and *M. catarrhalis*, a frank confession of doubt as to the specificity of the first-named microbe. The procedure, however, seems rational, since, as already stated, the ill effects of the disease are in great measure due to the secondary infections that are commonly grafted upon it. An alternative to this triple-barrelled measure is to await an attack in the susceptible person, and to investigate the flora of the upper respiratory tract during the first twenty-four hours of the disease. Actual information is thus yielded concerning the nature of the infective process, and a vaccine which has the great advantage of being homologous may be prepared for present and for future use. In a number of cases in which, after a fair statement as to the experimental nature of the whole process, patients have desired to attempt a process of protective immunization in this way, the results have been very promising. But it is worthy of note that as often as not the micro-organism against which these patients have been vaccinated has been another than Pfeiffer's bacillus, e.g., pneumococcus, *M. catarrhalis*, and various strains of streptococcus. Several formulæ have been suggested for the purpose of 'influenza prophylaxis', and reliable preparations are put on the market by the leading wholesale chemists.

The present position of prophylactic inoculation in regard to *colds* is much the same as it is in regard to influenza. The writer's own practice is to await an attack, to obtain an expert quantitative estimation of the flora of the nasal mucus early in the course of the illness, and to proceed accordingly. Several times it has happened, in doing this, that the dominant micro-organism has been quite other than might have been anticipated. Here again, a prevalent practice, and one growing in popular favour, is to inoculate with a vaccine prepared from a mixture of several micro-organisms commonly found in acute

nasal catarrh. The writer has had experience of prophylactic inoculation in several cases of *recurring acute sore throat*, in most instances streptococcal in nature, and can report some very satisfactory results. In these cases the preparation of an autogenous vaccine is desirable, for the streptococci concerned vary much in different cases.

17. **General Remarks upon Treatment by Specific Inoculation.**—Since the introduction of specific inoculation in the treatment of bacterial infections, antisera have very largely fallen into disrepute, probably undeservedly so. The pendulum has very likely swung too far in the direction of the newer remedy. The combination of both methods of treatment is eminently rational, and not seldom proves beneficial when one method alone fails. The recent trials of 'sensitized vaccines' (*see* Section 11) promise good results in the near future. However this may be, the present vogue favours bacterial vaccines. Some authorities go so far as to suggest that when antisera are helpful in treatment their value is due to their acting in the same manner as the injection of killed micro-organisms, viz., stimulating phagocytosis. But it must be remembered that this mode of action of vaccines is purely hypothetical. A few general considerations concerning the use of vaccines will precede the detailed description of the methods employed in the various infective diseases.

a. Cases Suitable for Treatment.—At the present stage of our knowledge of specific inoculation as a therapeutic measure, still very largely an experimental stage, it is impossible to lay down any definite rules that will guide the practitioner in the choice of cases likely to give good results. It will be assumed that he does not share the obsession that enthrals a few, that vaccine therapy is a panacea for all diseases that are of microbic origin. A distinction must constantly be made between certain hypotheses connected with the mode of action of bacterial vaccines, and the ascertained facts of actual observation; and seeing that as yet very little experimental work has been done along the lines of curative vaccine therapy, the only way by which the hypotheses can be properly tested at present is by the individual experience of careful workers. When the disappointments of vaccine therapy have been properly noted and the successes temperately recorded, some proportionate view of the usefulness of this system of treatment will doubtless be revealed. In the meantime no curb need be put upon any reasonable trial of the method; rather should every opportunity be taken of testing its efficacy. The only desiderata are careful technique and an unbiased review of results. As in the employment of other modes of treatment, so here: much room exists for accurate observation, but none for enthusiasm.

b. The Choice of Dose and Frequency of Administration.—In the suggestions made with regard to dosage in the subsequent consideration of various infective diseases, experience will be taken as the chief guide in the matter. Fallacious as this guide is notoriously known to be, it is believed by the writer to be more useful than that which is said to control the inoculations of many who make a study of this mode of treatment of infective processes; that is, the opsonic index. There are numerous reasons for considering that the opsonic index, though it may be of some value in diagnosis, does not always measure the degree of total immunity of a patient to the infecting micro-organism. These reasons cannot well be gone into here. Whether it is that this opinion has come to be shared by a growing number of clinical pathologists, whether the hypothesis upon which the opsonic index rests is now regarded as more improbable than was the case formerly, or whether, as is more likely, a determination of the opsonic index has been found to be unnecessary for the purposes of actual practice, need not be dwelt upon. It is quite certain that a very large amount of highly successful specific inoculation goes on to-day which is quite uncontrolled by opsonic determinations. It is equally certain that these empirical inoculations are very frequently undertaken by workers who formerly taught that such proceedings were highly dangerous and were to be strongly deprecated.

For the choice of dose and for the frequency of its administration, reliance should be placed upon a careful study of the clinical condition of the patient, and upon experience of similar cases already treated. There is good evidence from animal experiments, as the writer has shown, that the effective range of dosage of bacterial vaccines is fairly wide, and that within this range no ill effects are likely to ensue to the patient. An equal degree of immunity to staphylococcal infection may be conferred upon rabbits by the use of vaccines differing in amount in similar animals by as much as 100 per cent. It

may also be shown that animals will tolerate very large doses of bacterial vaccines when injected subcutaneously without loss of weight and without other evidence of ill health. Of greater importance than these observations on animals is the fact that in man, careful employment of vaccines, uncontrolled by opsonic indices, has not led to any of the dire calamities which were predicted for it. On the other hand, it has led to a large number of good results in the treatment of bacterial infections, and promises still better results when experience of the treatment shall have ripened.

Although this form of therapeutics may be now said to have passed the experimental stage, considerable differences of opinion and of practice still exist in regard to dosage. It does not, however, follow that even when experience of the treatment is much greater than at present, the question of dosage will settle down into one fixed rule which all will observe. Despite the many observations that have been made with regard to the use of antidiphtheritic serum, opinions still vary as to the optimum size and frequency of dose; but the results of this therapeutic measure are, in the main, universally good. And in this instance, be it observed, there is no existing hypothesis which claims to control the question of dosage. The doses of vaccine suggested below are those which are most generally employed. They are set out tentatively, for they are by no means arbitrary, being modified in individual cases as seems necessary. One of the great difficulties attending the question of dosage of bacterial vaccines is the variation in virulence of different strains of the same micro-organism, and of the same strain after sub-culture. Particularly does this difficulty apply to various strains of the streptococcus group, to the pneumococcus, and to the gonococcus. It is very doubtful if this difficulty is sufficiently recognized by those authorities who claim that the opsonic index gives a correct guide to the amount of vaccine (bacterial endotoxin) which should be employed. Tables of suggested doses, say of killed gonococci, which are recommended by an observer for use in particular cases, lose much of their value on account of this important fallacy. Experience shows that, whereas in the case of one strain a dose of five million killed gonococci produces a marked local reaction at the site of inoculation and is followed by an exacerbation of a urethral discharge, in the case of another strain neither of these effects follows the use of a dose of a hundred million killed cocci. Another difficulty in the adjustment of dosage, though apparently a less disturbing factor than that just named, arises from the individual differences seen in the response made by various patients to the same dose of the same strain of a micro-organism. This difference is often seen in the simple case of prophylactic inoculation against typhoid fever. A similar position exists, in a more complicated fashion, in regard to many cases of curative inoculation. Although no definite rules can be laid down for the size of the dose of vaccine which it is desirable to use in the treatment of various infective processes, the following principle may be safely stated: *the more virulent the micro-organism, and the more acute and the more generalized the disease-process, the smaller should be the dose of vaccine employed.*

c. The Use of Stock Vaccines.—Several of the stringent rules originally laid down for the employment of vaccine therapy have lately been relaxed, as well by those authorities who enunciated such rules as by those who from the first doubted the wisdom of proceeding by rule at all in a path as yet so little trodden. One of the first of these rules to yield was that which made it imperative to employ a vaccine made from the micro-organism actually isolated from the patient under treatment. It has become a moot question whether this particular rule has not been relaxed too much, and whether the indiscriminate use of vaccines that are kept in stock by the wholesale chemists will not shortly bring the whole subject of vaccine therapy into disrepute; for the 'stocking' of vaccines leads to a temptation to waive the important matter of bacteriological diagnosis without which successful treatment cannot possibly be expected. Moreover, it is certain that vaccines deteriorate by keeping; *whenever it is possible, therefore, the particular vaccine used should be specially prepared for each patient.* There are instances, however, in which the use of a stock vaccine is not only allowable but compulsory. Thus, it may be advisable to treat gonorrhœal arthritis in a patient from whose blood, joints, and urethra no gonococci can be isolated; in this case appropriate doses of a vaccine recently prepared from another strain, or better, from a number of different strains, are therefore given. Again, in a case of erysipelas it may not be possible to cultivate the streptococcus

hich is most probably the cause of the skin infection ; a small dose of *Streptococcus yogenes* vaccine obtained from another case of erysipelas, or, failing this, from any case acute *Streptococcus pyogenes* infection, is administered. But such procedures should ways be regarded as 'second best', and are to be strictly reserved for cases of bacterial fection in which it is customary to employ 'stock vaccines'—those in which the culti- ation of the micro-organism concerned is very difficult and its growth very slow. xamples are—all cases of tuberculosis, some cases of actinomycosis and other strep- othrix infections, cases of simple acne, etc. One or other of the various forms of mmercial tuberculin is almost invariably used in vaccine treatment of tuberculosis. ut even here it should be remembered that vaccine specially prepared from the patient's vn strain of tubercle bacillus may conceivably lead to a better result, and recent methods facilitating the growth of the bacillus on artificial media render this procedure less fficult than formerly. Lastly, it is sound practice to use a stock vaccine of a more rulent strain of micro-organism than the one isolated, or of a mixture of several different rains, if it is found that little or no good follows the use of the micro-organism actually esent in the lesion under treatment.

B.—SPECIAL.

Consideration will now be given to particular microbic infections that are, in actual actice, treated by some form of specific therapy. Stress will be laid upon those fections commonly met with in Great Britain. These, so far as specific treatment is ncerned, may be grouped as follows :—

1. Treated by Immune Sera :—

a. By antitoxic sera : diphtheria, tetanus.

b. By bactericidal sera : streptococcal and pneumococcal infections, anthrax, cere- ospinal fever.

2. Treated by Bacterial Vaccines :—

Staphylococcal, streptococcal, pneumococcal, gonococcal, and *B. coli* infections, cillary dysentery, typhoid fever, influenza, tuberculosis, streptothrix infections.

The various infections will be dealt with in the order above enumerated.

Diphtheria.

This, the first of the infective diseases to be treated by specific measures, remains e most successful instance of serum therapy. Diphtheria antitoxin (antidiphtheritic rum) has reduced the mortality of the disease from 30 to 10 per cent, and is nowadays garded, quite justly, as constituting the essential treatment at all stages of the infection. he chief desideratum is to give the serum *at the earliest possible day of the disease* ; any day, even for a few hours, after the diagnosis has been made by bacteriological investiga- on, or strongly suspected by careful clinical examination, constitutes a serious error in actice ; for it is shown by statistical records that, even with antitoxin treatment, the rtality of the disease rises steadily from the second to the fifth day with each day's day in the administration of the remedy. The second desideratum is to give a *fficiently large dose of the antitoxin. The later the date at which the treatment is commenced e larger should be the dose of antitoxin given.* Thus, if the treatment begins on the cond day, and the case is one of only moderate severity, 3000 units will probably suffice. ut if it begins on the fifth day, as is often the case in hospital practice, a dose of 6000 its should be given. These doses should be increased, quite apart from the duration the disease, if the infection is an extensive one and if the constitutional disturbance is rked. Thus, in a case in which there are both faucial and laryngeal involvement, and eatment is begun on the fourth or fifth day, a dose of 8000 units is none too much.

Age does not affect the dose of antitoxin—a child should receive as much as an adult. his rule of practice is followed because the disease is a more serious affair in children an in the adult, and carries a more grave prognosis.

It is important not to wait for bacteriological confirmation of the clinical diagnosis, here this is made, before giving the antitoxin. On the other hand, if a bactoriological vestigation demonstrates the presence of diphtheria bacilli in a case previously thought clinical grounds not to be diphtheritic, the patient should then be given the benefit the antitoxin treatment.

The initial dose having been given, its size being determined by the above considerations, the practitioner now waits some eight to twelve hours, watching the progress of the case. If unfavourable, the antitoxin is repeated, and it is now advisable to give a still larger dose. Many authorities say that a dose double the initial one should be given, and this recommendation may well be followed. At the end of a second twelve hours, if the condition has not improved, a third dose, again double the initial dose in size, is recommended. After this, it is very unlikely that any further benefit will be derived from the serum.

The mode of administration is injection by the subcutaneous route, as described in Section *A*. 12. But in very severe cases, and when the treatment is begun late, it is a good plan to give the initial dose intravenously (*see A*. 12). Oral and rectal administration of the serum, even if proved to be efficacious in certain cases, are not to be recommended as equal in efficacy to the subcutaneous use of the serum. The *type of the disease* is quite immaterial to the success of the remedy: all varieties of diphtheritic infection—even skin infections—indicate the use of the serum.

The *prophylactic value* of diphtheria antitoxin is firmly established. The immunity conferred appears to last about three weeks. In epidemics occurring in schools or other institutions, the use of the serum in the case of contacts is of great value. The dose usually chosen is 1000 units.

The serum keeps very well, for a year certainly. It should be kept in the dark and in as cold a place as possible.

Tetanus.

This is the infective disease for which there is the greatest evidence, next to diphtheria, that a degree of immunity may be conferred by the use of antiserum. As in diphtheria, the serum is a true antitoxin. The experimental evidence of its efficacy is undoubted, but the results of its use in practice are much more ambiguous; this is explained, quite rationally, by the supposition that the tetanus toxin has already fixed itself upon the nerve tissues at the time when the antitoxin is administered. Unlike diphtheria, tetanus cannot be diagnosed by means of the initial local lesion, and therefore the constitutional effects of the poison cannot be anticipated, unless it be by systematic bacteriological examination of all suspicious wounds, a procedure that has much to recommend it. By the time the disease is made manifest, therefore, much of the toxin is already 'fixed' in the central nervous system, and the results of treatment by antitoxin are of necessity often unsatisfactory. The prophylactic treatment of wounds likely to lead to tetanus has, on the other hand, proved very beneficial, as amply demonstrated in the Great War. The prophylactic use of antitetanic serum ('A.T.S.') is therefore regarded to-day as being of even greater utility than is its curative use. The *dose for prophylactic purposes* is 500 units given subcutaneously in four doses, at weekly intervals. The *mode of administration for curative purposes* is a much-debated question. Some authorities advise intraneural, intrathecal, and intracerebral injections of the serum so as to endeavour to neutralize the poison in the nerve structures. Perhaps the best method at present, and until more accurate knowledge is forthcoming, is to give an initial injection of 500 units into the spinal theca by an ordinary lumbar puncture, and to follow this by 1000 units into the subcutaneous tissues daily for four to six doses. If the case is acute, and treatment is late, it may be advisable, in addition to the above, to inject 500 units of the serum directly into the cerebral ventricles by means of a small trephine hole.

Streptococcus Infections.

The success of antidiphtheritic serum was such that great hopes were entertained for similar good results from antistreptoccocus serum when it was first introduced. These hopes have been by no means fulfilled. Streptococcus infections are, however, of various kinds, and in a considerable proportion of them there is evidence that the micro-organism exists in the blood-stream, a state of things not obtaining in diphtheria. Moreover the genus streptococcus comprises several species, and these differ amongst themselves by wide variations. This latter difficulty has been thought by serum manufacturers to be overcome by the introduction of 'polyvalent' serum, to which reference has already been made (*A*. 9). But it should be noted that a 'polyvalent' serum is one prepared by

oculating the horse with streptococci derived from a variety of sources, not one prepared
using streptococci showing differences in biochemical reactions.

This may account for some, at least, of the failures in the use of the serum. How-
er this may be, it seems clear, from clinical experience, that antistreptococcus serum
metimes 'works miracles' and sometimes produces no good results whatever. Un-
rtunately it is not yet fully apparent why this discrepancy exists.

At the present stage of specific therapy, streptococcus infections are treated both
immune sera and by vaccines. Broadly speaking, it may be said that *the more acute*
e infection, the more likely is immune serum to do good; the more chronic the infection,
e more likely is vaccine to do good. It is sound practice to begin treatment in an
ute case by a liberal administration, either intravenously or subcutaneously, of
atistreptococcus serum, and to follow this by the employment of homologous vaccine.
ven better than this, probably, is the method of using a sensitized vaccine (*see A.* 11),
r it is in the treatment of acute streptococcal infections that this method has given the
st results up to date. In a chronic case the serum may be omitted and vaccines used
om the first. If the infection is by *S. pyogenes*, the writer is strongly of opinion that a
ivalent pyogenes serum is best. If the infection is by a streptococcus of the salivary
fæcal type, a 'polyvalent' serum is probably best. If a sensitized vaccine be used,
e appropriate serum should be employed for its manufacture. The subject is a very
fficult one, and little more than general hints can be given in the following consideration
the chief types of streptococcus infection. The local infections will be considered first,
e general infections afterwards.

1. **Erysipelas.**—The infection is probably always by *S. pyogenes*. The treatment
commended is to begin by giving 50 c.c. of serum, choosing the univalent pyogenes
rum, and following this by small doses of vaccine, such as from 2 to 5 million cocci, on
ternate days, for four doses. If a sensitized vaccine be used, doses of 100, 250, and 500
illion may be given on successive days. If it is possible to cultivate the streptococcus
om a vesicle of the actual case under treatment, so much the better. Promptness in
e use of any available material is an important consideration. If the isolation of the
reptococcus from the actual case is not possible, a stock vaccine derived from a case of
ysipelas, or, failing that, from an infection due to *S. pyogenes*, should be used.

2. **Cellulitis and Acute Abscess Formation.**—A similar line of treatment may be
opted.

3. **Pyorrhœa Alveolaris.**—This is, in the opinion of the writer, generally if not
ways due to *S. salivarius*, a short-chained streptococcus of feeble virulence, yielding
actions distinct from *S. pyogenes*. Local treatment failing to cure the disease, or only
taining partial success, it is advisable to try the effect of a course of vaccine therapy.
he writer does not, however, share the opinion of those who consider that local treat-
nt is of secondary value compared with treatment by vaccines.) It is advisable to
gin with doses of 10 million cocci, given at intervals of eight to ten days, increasing
adually, if necessary, to 500 million cocci. The material from which the vaccine is
epared is to be taken from the depths of the pockets (or, better still, from the fang of
extracted tooth, if such there be), and not from the cheesy pus lying about the surface
the gums.

4. **Septicæmia and Pyæmia** (puerperal fever, infective endocarditis, etc.).—It is
ite certain that in general streptococcal infections the results of treatment by vaccines
ve been less promising than in cases of localized infection. It would appear that the
ore generalized the infection the less marked the benefits of specific inoculation.

The method of treatment of these very grave conditions which gave most promise
til very recently was by an initial use of a large dose of immune serum, given intra-
nously, and repeated subcutaneously on alternate days or every third day. The initial
se should not be less than 50 c.c. As soon as the vaccine could be prepared, a very
all dose was given, such as 0·5 million cocci, and this was very gradually increased to
to 5 million by inoculation on alternate days or on each third day. Sometimes a dis-
ctly good result followed the use of a large dose, even of 50 million cocci, but such a
se as this must only be given after careful consideration of all the features of the case,
d of the type of streptococcus at work. (Thus, in cases of *puerperal fever*, especially
those in which auto-infection takes place—? from the bowel—the streptococcus isolated

from the uterus or from the blood-stream is often *S. fæcalis*, and as this type of streptococcus is not nearly so virulent as *S. pyogenes*, larger doses of the endotoxin may be given for the purpose of stimulating the formation of antibodies.) But quite recently still better results have followed the use of sensitized vaccine. The dosage varies in the hands of different workers. A common mode of administration is by the 'steppage' method: giving, say, three successive daily doses of 100, 250, and 500 million cocci, then, after an interval of three or four days or longer, according to the course of the disease, a similar series of 250, 500, and 1000 million cocci—and so on. In cases of *ulcerative endocarditis* specific therapy of any kind is notoriously disappointing. This is especially true in the cases of chronic infection, which are not at all uncommon. However, the best hope still lies along the line of treatment just indicated. The cases that have recovered after specific treatment have demonstrated the necessity for very thorough trial of the measure. It seems certain that, despite the recent additions to knowledge concerning this grave malady, there remains still unknown some important clue to successful treatment of this type of infection.

Pneumococcus Infections.

Next to antistreptococcus serum, the 'bactericidal' serum to which most extensive trial has been given is the antipneumococcus serum; but the results have been even more disappointing than with the antistreptococcus serum, so far as the brands of immune serum at present on the market are concerned. One or two local pneumococcal infections, however, appear to have been markedly benefited by the serum, particularly that form of *corneal ulcer* which is due to the pneumococcus.

At the time when the inefficacy of immune serum led to a pause in the specific treatment of pneumococcal infections, the introduction of vaccines in the treatment of pyogenic diseases gave a definite fillip to the efforts of the therapist. A variety of pneumococcal infections have been treated in this way, often with very good results.

1. **Pneumonia.**—By some observers the time of crisis is said to be hastened by the use of small doses of vaccine. Others do not confirm this. There is certainly no very noticeable difference in the course of the disease when untreated or when treated by vaccines. It is, of course, highly probable that in the great majority of cases of pneumonia adequate 'auto-inoculation' is proceeding, and it is probable, too, that the crisis is the sign that this 'auto-inoculation' has been successful. If, however, a case of pneumonia is not running a satisfactory course—if, for instance, the crisis has not arrived by the tenth day of the disease—it is advisable to give a small dose of vaccine such as 5 million cocci, and to repeat this in two or three days if necessary. The vaccine should be prepared from the actual strain of pneumococcus causing the infection, derived either from the sputum or from a lung puncture.

2. **Empyema.**—After drainage has been established, the healing process may be hastened by the use of a vaccine, and this should certainly be tried if the case 'hangs fire'. Weekly doses of 10 to 50 million cocci may be given.

3. **Bronchopneumonia.**—Good results follow vaccine treatment more often in lobular than in lobar pneumonia, perhaps because the former disease much less often runs a 'natural course'. Small doses of vaccine should be given, such as 2 to 5 million cocci with three to four days' interval between the doses.

4. **Bronchitis; Asthma; Infections of the Upper Air-passages.**—These and some other catarrhal conditions are often treated by vaccines with success. As with other diseases, it is, of course, advisable to use the vaccines as adjuncts in the treatment, and not to rely solely upon them. The infections in these cases are often 'mixed', especially with *M. catarrhalis* and Pfeiffer's bacillus (*B. influenzæ*). When this is the case a mixed vaccine may be employed. The doses, and intervals between the inoculations, will depend much upon the nature of the case under treatment, and can only be decided by experience and a careful study of the patient's condition. Chronic cases indicate larger doses than acute ones. Careful quantitative bacteriological examination of the sputum is essential to success.

5. **Pneumococcal Septicæmia and Pyæmia.**—The principles of combined treatment by serum and vaccine, or, better, by sensitized vaccine, as indicated for streptococcal infections, should be carried out here also.

Anthrax.

The drastic surgical treatment of malignant pustule formerly adopted has in recent years become less universal. Some authorities now prefer local treatment by fomentations, and attention to the general condition. Whichever of these methods be adopted, it is advisable to add the use of an immune serum, seeing that very favourable results have been recorded as following its administration. The serum most used, prepared originally from goats and later from asses, is Sclavo's. It is thought to be 'bactericidal' in its action. A large dose is used, preferably 50 c.c., injected into each flank. If the case is very acute and severe, it is advisable to give the injection intravenously. (*See* 1. 12.)

Cerebrospinal Fever (Meningococcal Meningitis).

Several workers have succeeded in manufacturing an *antimeningococcus serum*, the use of which certainly appears to be of benefit in cases of cerebrospinal meningitis, whether sporadic or epidemic. The dose of this serum varies from 15 to 45 c.c., according to the severity of the case. It should be given intraspinally, after removing by lumbar puncture a quantity of cerebrospinal fluid equal to the dose of the serum (for technique, *see A.* 12. *d.*) Subcutaneous administration of the serum is useless. The serum should be repeated after forty-eight hours, and again if necessary, according to the course of the case. It is sometimes advisable to repeat the administration every other day, or every third day, until it is certain that its use is not controlling the infection. The best results are obtained by 'grouping' the particular strain of meningococcus, and choosing the appropriate 'group' serum. Doubtless some of the good effects seen are due to the lumbar puncture and consequent drainage.

Staphylococcus Infections.

The treatment of staphylococcal infections by vaccines has been proved of such value that immune sera, never shown to be of much benefit, have quite fallen into disuse.

1. **Chronic Local Infections.**—The diseases coming under this head are *boils*, *carbuncle*, *sycosis*, *pustular acne*, some forms of *eczema*, *ciliary blepharitis*, *otitis media*, and *suppurating Meibomian cyst*. Of these diseases, boils react best to vaccine treatment; so well do they react that a cure, more or less long-standing, may confidently be promised to almost every patient. Historically the first of the staphylococcal infections to be treated by Wright's method, furunculosis still remains the most responsive to the new therapeutic measure. Taken as a whole, the furunculosis group of cases stands almost alone in respect of the uniformity of results obtained with the treatment; so much so, that a guarded prognosis must always be given in the other forms of staphylococcus infection. But even here individual cases often do remarkably well, though now and again others are disappointing. In *acne* some degree of success may always be promised, but the ultimate result differs according to the various etiological factors present. As an adjunct to other modes of treatment, vaccine therapy is invaluable. If attention to the general health, digestion, etc., be omitted, and no pains be taken with the toilet of the skin, failures will certainly be met with in those cases where the infective element is not dominant. Patients are often too sanguine on account of the glowing testimonial of some friend whose lesions were quite different from their own; they must be led to modify their expectations, and must be prepared to add to the inoculation treatment the less novel aids to recovery already referred to.

Under the same heading may be mentioned the treatment of *sinuses* left after the bursting or opening of abscesses, or after operations. Here it is of great importance to commence treatment early. It goes without saying that efficient surgical measures must always be undertaken in conjunction with the inoculation treatment; to overlook an abscess or to neglect proper drainage of a sinus is but to court disappointment. Vaccine therapy is often an adjunct, but never a substitute, in sound surgery.

As regards *dosage*, custom has changed at least twice since the introduction of vaccine treatment for furunculosis, and this despite the fact that the principles underlying the opsonic hypothesis have not altered. It is probable that the changes have been the natural result of clinical observations, oscillations such as often occur in medical opinion pending the trial of a new remedy. At first comparatively large doses of cocci were used

—at least 1000 million—and this dose was often increased still further. Some results proving unsatisfactory, the pendulum was swung in the other direction, and 100 to 250 million were considered appropriate inital doses. Some workers still use such doses, but most observers agree that 1000 million is the best with which to begin the treatment of an ordinary case. This is followed by doses of 250 to 500 million, with intervals of seven to ten days, if improvement follows the first dose. Should relapses occur, it is probable either because the dose is not high enough, or because inoculations are too frequently repeated, and this can usually be discovered by a little care. Much individual difference exists in this matter. In most cases the doses of vaccine can be 'spaced' further after the fourth dose, allowing fortnightly, three-weekly, monthly, and two-monthly intervals. It must be confessed that by proceeding in the opposite manner, and graduating the doses upwards, equally good results are often obtained, and some workers adopt this plan as a routine. Thus, 250 million may be given as the initial dose, 500 million a week later, and 1000 million at the third or fourth inoculation. This latter method is perhaps better for patients who are constitutionally affected (e.g., diabetics, etc.).

Chronic carbuncle is treated in the same way, whether surgical interference be also adopted or not. In the treatment of *acne* much the same line is adopted. In nearly all cases the concurrent use of local applications will be found of advantage. The exact relation of Sabouraud's bacillus to the lesions of acne is still a matter of debate. Dr Alexander Fleming has recorded good results from the use of a mixed vaccine of staphylococcus and the 'acne bacillus', and many observers have confirmed these results. In *sycosis* the response to the smaller doses used in furunculosis is usually good if the treatment is carried out early. If, however, the case is of some standing, and deep-seated inflammation with induration is present, the effect of the inoculations is not so good. In such long-standing cases good effects will sometimes follow dosage of 2000 to 5000 millions cocci when previous inoculation by smaller doses produces very little result. The same remark applies to some cases of long-standing acne with much induration. In these injection of the vaccine close to the seat of the lesions is often of benefit. In connection with sycosis, as with acne, it is courting disappointment to neglect other forms of treatment, such as epilation and the free use of mercurial applications. In *chronic sinus infections*, again, the result of small doses of vaccine is usually disappointing; these sinuses are apt to be lined by fibrous tissue, and they need radical surgical treatment with vaccines as an adjuvant. In *ciliary blepharitis*, success usually follows the use of doses recommended for furunculosis.

2. **Acute Local Infections.**—*Acute boils and carbuncles* tend to abort when treated with an early dose of vaccine, and no ill effects appear to follow such treatment. In favour of treating these conditions by vaccine is the fact that either of them may prove more serious than at first sight promises. Thus, subsequent unfavourable development may be due to the position of the lesion, e.g., near to the inner canthus of the eye, leading to orbital abscess or even to meningitis, or they may be due to the general condition of the patient, e.g., the enfeebled resistance of old age. For these reasons any opportunity of influencing beneficially the patient's degree of immunity by vaccine treatment at an early stage should certainly be undertaken. If it appears probable that a boil or a carbuncle, when first seen in the stage of redness and induration, will eventually 'come to a head', this sequence may be encouraged by the use of a large dose of vaccine, i.e., 100 million cocci. In this way time may be saved and eventual scarring minimized. In the case of boils of the external auditory meatus, of the nose, and of other situations which are very painful, such saving of time is much appreciated by the patient.

If the carbuncle is already developed, it is best treated by small doses of killed cocci on alternate days, say 20 to 50 million. Other acute staphylococcal infections may be similarly dealt with (e.g., *poisoned fingers*, and *acute abscesses* after surgical treatment).

3. **Chronic General Infections.**—In *chronic staphylococcal pyæmia*, 50 to 100 million killed cocci may be administered every four to seven days, omitting the inoculation just prior to, and just after, any surgical treatment of abscesses or sinuses that may develop.

4. **Acute General Infections.**—A résumé of an actual case will serve to illustrate the method of treatment that may be tentatively adopted. *Osteomyelitis of ilium. S. aureus; pyæmia.*—The patient was a man aged 35 years. *S. aureus* was isolated

pure culture from a local lesion and from the blood-stream. The abscess in the bone was opened without any abatement of the symptoms; a few days later an abscess was also opened in the shoulder-joint. The patient was extremely ill, and his life despaired of. A dose of 50 million killed cocci, prepared from the positive blood-culture, was administered, and this was quickly followed by marked improvement. A similar dose was given five days later. Four days after this second dose, the dose was increased to 100 million cocci; the condition still further improved, and the temperature now became normal. Ten days after the third inoculation, pus was withdrawn from the knee-joint; this pus was sterile on culture, and the knee-joint did not require further drainage. A fourth dose, consisting of 100 million cocci, was now given. The patient recovered completely, his sinuses healing rapidly. He was discharged from the hospital quite well, three months after admission.

Gonococcus Infections.

The use of immune sera has not led to any promising results; in this respect gonococcus infections resemble infections due to staphylococci, to which group the gonococcus probably belongs in a strict bacteriological sense. In 1905, the writer employed an antigonococcus serum in the treatment of some cases of gonococcal arthritis, and with success; but some control cases treated by normal horse serum also gave good results, and made it doubtful if the good effects of the immune serum were really due to any specific antibody present in the serum. At present, the only kind of specific therapy extensively used in this form of infection is inoculation by bacterial vaccines.

1. **Acute Urethritis, Vaginitis, and Cervicitis.**—The course of these cases is probably shortened by the employment of small doses of vaccine (from 1 to 5 million cocci) every three or four days. If local treatment is also used, the chemicals should be very weak, and adapted to simple cleansing rather than to irritation of the mucosa.

2. **Chronic Urethritis and 'Gleet'.**—The dose of vaccine may be larger (from 10 to 500 million cocci), every seven to ten days. Care must be exercised to exclude mixed infections, especially by staphylococci and by diphtheroids, and if these are present to any degree, appropriate vaccines must be prepared and administered. In cases of long-standing gleet, the results of vaccine treatment are sometimes disappointing, but this is occasionally due to neglect of the secondary infection.

3. **Gonococcal Arthritis (Gonorrhœal Rheumatism).** — Good results are more uniformly seen in this class of case than in either of the two preceding groups. The system of dosage must be adapted to the type of case under treatment. (*a*) In *acute* cases doses of 1 to 5 million may be given at intervals of three to five days, the effect upon temperature and symptoms being watched. (*b*) In *subacute* cases these doses may be somewhat larger and less frequent. (*c*) In *chronic* cases treatment should be begun tentatively with doses of 10 to 20 million cocci, to test the virulence of the strain of vaccine used. This is done because in this class of case it is not possible, except in rare instances, to get the patient's own micro-organism; recourse has therefore to be made to a stock vaccine. The dose will probably need a considerable increase before good effects follow—to 50, 100, and 200 million cocci. The doses are 'spaced' more widely than in less chronic cases—with two, three, and four weeks' interval as the treatment progresses. The writer has seen excellent results from doses as large as 400 and 500 million cocci in cases of very old-standing pains in the feet, ankles, knees, and spine. Some American workers have given doses as large as 1000 million cocci for a single inoculation, and have reported good results (cf. dosage in chronic staphylococcal infections).

4. **Iritis.**—In acute iritis, if accompanying the original urethral infection, care must be taken to employ very small doses of vaccine (0·5 to 1 million cocci). In the recurring iritis which is so significant a feature in some cases of gonococcus infection, and which sometimes shows the persistence of the disease for a number of years, the writer's method is as follows: During the evolution of the attack the non-specific measures in the treatment are supplemented by very small doses of vaccine, as above. When the attack has subsided, the dose is gradually increased, and the interval of administration is at the same time lengthened. By this means the tendency to recurrence is in a fair number of the cases diminished or altogether destroyed.

Homologous and Heterologous Vaccines.—Reference has already been made to the varying virulence of different strains of gonococci. Wherever possible, therefore, it is

important to employ the actual strain of gonococcus causing the infection from which to prepare the vaccine. This is only possible where the local lesion is still present, or where a general infection leads to the presence of the micro-organisms in the blood-stream or in a joint. In a large number of the cases presenting themselves for treatment, neither of these conditions prevails. The practitioner must then fall back upon a 'stock' vaccine. *A stock gonococcus vaccine should be made from recent cultures of several strains of gonococci.* Such a vaccine can usually be obtained from pathological institutes on the staff of which is a bacteriologist interested in vaccine therapy.

Bacillus Coli Infections.

An *anti-colon bacillus serum* has been on trial, but there is little definite evidence of its value as a therapeutic agent.

B. coli vaccine is, however, very definitely of service in a large number of infections by this micro-organism. Its efficacy perhaps ranks next to that of staphylococcus vaccine in the experience of many.

1. **Infections of the Urinary Tract.**—Cases of *cystitis* and *pyelitis* due to *B. coli* infection, which resist treatment by local means and urinary antiseptics, should be treated by vaccines prepared from fresh cultures of the urine. The results are very variable. In the main it may be said that where constitutional symptoms are present they are almost always benefited; frequency of micturition and dysuria are relieved; pus is reduced in quantity, and often completely disappears; a mere state of bacilluria, however, is rarely (in the experience of the writer) affected beneficially. A very useful mode of procedure is to begin by inoculations at weekly intervals, giving 10 million bacilli for a series of four doses. The dose is then increased to 20 million for a series of four more doses, at intervals of a week to ten days. This dose may then, if necessary, be further increased to 50 million bacilli at intervals of a fortnight. It is rarely necessary to increase the dose beyond this amount; but in a few chronic cases doses up to 250 million bacilli appear to produce good results when smaller doses are ineffectual. *In all long-standing cases it is essential to deal with fresh cultures of the bacillus at stated intervals.*

2. **Post-operative Suppuration** is not seldom due to *B. coli* infection, especially after appendix operations. The cases are sometimes due to mixed infections, such as *B. coli* and *staphylococcus* or *B. coli* and *Streptococcus fæcalis*. Some of the most successful instances of treatment by specific inoculation are found in this group of infective conditions complicating surgical procedures. Delayed convalescence after abdominal operations, when local infective processes are going on in the neighbourhood of the wound, indicate treatment by vaccines. Small doses are sufficient (e.g., 5 to 10 million *B. coli*, or 10 to 50 million *Staphylococci*) to begin with; subsequent doses must be determined by the progress of the case.

3. In **Colitis,** whether simple, 'mucous', or ulcerative, the patient may be submitted to vaccine treatment in conjunction with whatever other methods of therapeutics are being undertaken. Most of the cases are associated with infection by a coliform micro-organism. Cases of 'chronic dysentery' come into the same group so far as this indication is concerned. Great care must be exercised in the selection of the colonies of growth (usually obtained from the stools) from which the vaccine is prepared, and for this purpose expert bacteriological knowledge is necessary. 'Stock' vaccines are to be avoided, or disappointment is courted. The results are by no means uniformly good. In cases associated with marked nervous symptoms, and in 'ulcerative colitis', the treatment is rarely satisfactory. But in many cases lying between these two extremes much benefit is seen from inoculation. In not a few cases there is infection of both the urinary and the intestinal tracts: the cases should certainly be given a chance of improvement or cure by vaccine therapy. The dosage recommended is much the same as in dealing with urinary infections.

Typhoid Fever.

An *antityphoid serum*, introduced by Chantemesse, has had considerable vogue in France, especially in prolonged cases of the disease. It has not been used to any extent in England.

Typhoid vaccine may be administered in bad or prolonged cases: a dose of 10 million

bacilli, repeated on alternate days for six doses, seemed to the writer to determine a successful issue to an extremely severe case in which meningitis was present. Some observers have given much larger doses, and claim good results. The vaccine should be specially made for each patient, and by preference from the bacillus recovered from the circulation by blood culture. Sensitized typhoid vaccine is perhaps preferable. (For prophylactic typhoid inoculation, *see* Section A. 16. *b*.)

Tuberculosis.

Although *antituberculous sera* have been introduced by Marmorek and others, there appears to be very little evidence that their use is of any definite value in tuberculous infection. The only form of specific treatment at all widely adopted is by '*tuberculin*' in some form or other. Roughly speaking, there are three substances available for the purpose of specific inoculation: (*a*) *Tuberculin*—an extract of the bacillus with or without its toxins—of which there are several varieties (Koch's, Béraneck's, Denys', etc.); (*b*) *Bacillary emulsion*—a true 'vaccine' of the tubercle bacillus, made exactly as in the case of other vaccines (q.v.); and (*c*) *Tuberculosis sero-vaccine*, a form of sensitized tubercle bacilli prepared after the manner of sensitized vaccine, referred to in Section *A*. 8. The last-named substance has only recently been available. The second-named material is growing in favour. The first-named product is the one in general use, and to it the following remarks apply. The variety of tuberculin in common use is Koch's tuberculin T.R. ('new tuberculin', *T. rückstand*).

At the present time there exist considerable differences of opinion both in the choice of cases to submit to tuberculin treatment, and in the manner of dosage.

1. *Choice of Cases.*—Most authorities agree that it is inadvisable to give tuberculin to patients who are markedly febrile, and particularly those febrile patients who show much oscillation in their temperatures and in their general condition. There is also a large consensus of opinion that no patient should be started upon a course of tuberculin treatment immediately he comes under observation. The best cases to select are undoubtedly those in whom there have been produced, as the result of non-specific measures, some definite retrogressive changes in the tuberculous lesions. Upon the return to ordinary life, for example, of a phthisical patient who has undergone sanatorium treatment with satisfactory results, but who cannot avail himself of this mode of treatment up to the point of complete healing, a course of tuberculin may well be added to those non-specific measures which, if he be wise, he has learnt to weave into his daily routine of life. In such cases small doses of tuberculin appear to act beneficially by stimulating resistance and hastening the processes of healing.

These considerations do not take into account those experimental efforts made to check the course of rapidly progressive and desperate forms of tuberculosis which show no response at all to other methods of treatment. Such efforts upon rare occasions *seem* to be fraught with success; and the most that can be said against them, provided great caution be exercised in the choice of dose, is that they are usually doomed to disappointment.

The most definitely satisfactory results of tuberculin treatment are probably seen in cases of *genito-urinary* infection, in cases of *early adenitis*, and in tuberculosis of the *peritoneum* and of the *joints and bones*. In *lupus*, most authorities agree that some results of tuberculin treatment are very good.

2. *Choice of Dose.*—There is no rule guiding the size of dose of tuberculin, or the frequency of its administration; both have decreased a good deal of late in the practice of most observers. The rule already formulated concerning vaccines in general should be observed here: the more acute and generalized the infection, the smaller should be the dose. Seeing that some workers employ what seem to the writer unnecessarily heroic doses, and others give doses that seem unnecessarily minute, and yet both claim good results, it appears reasonable to strike a middle course, and this is probably what most practitioners do. In cases of average severity, an initial dose of $\frac{1}{10000}$ mgrm. may be chosen, and repeated for a series of four doses. The time interval should be determined by the nature of the case. The more acute it is, the longer the interval should be. Three clear days is a common interval for a chronic case, seven to ten days for a subacute case. A second series of four doses of $\frac{1}{10000}$ mgrm. may now follow, somewhat longer intervals

being observed ; and so on, advancing by $\frac{1}{10000}$ mgrm. at every fifth dose until the dose reaches $\frac{1}{1000}$ mgrm. It is doubtful if anything is gained by an increase past this point.

It is probably of no service in the treatment to aim at a 'reaction' to the dose of tuberculin employed ; indeed, should any dose be followed by a reaction, either at the site of the lesion or elsewhere, or by a rise of temperature, the dose should not be increased for a while. It is therefore advisable to take the patient's temperature four-hourly during the forty-eight hours following an injection.

Some authorities give tuberculin by mouth, and recommend this method of administration. The writer cannot endorse the recommendation, except perhaps in the case of little children, and even then tactful management usually serves to make the subcutaneous route possible. In addition to the disadvantages set forth in Section *A*. 13, it has been shown that enormous doses of alt-tuberculin may be given by mouth to susceptible persons without reactions and without producing immunity to diagnostic tuberculin.

Thomas J. Horder.

SPERMATORRHŒA.—Spermatorrhœa may be defined as the involuntary escape of semen unattended by erection, voluptuous sensation, or desire ; it is not a disease, but is rather a symptom of the condition known as sexual neurasthenia, and described under the heading of IMPOTENCE. Seminal emissions occur in the perfectly healthy, and are due to a simple physiological reflex action, the distention of the seminal vesicles giving rise to a contraction of the muscular fibres by which they are surrounded, and so causing an expulsion of their contents. But should such emissions occur at frequent intervals, they may be prejudicial to health, and are usually due to an abuse of the sexual organs. This condition is commonly associated with nervous IMPOTENCE, and the treatment of it is described under that heading.

J. Ernest Lane.

SPHENOIDAL SINUSITIS.—(*See* NOSE, ACCESSORY SINUSES OF.)

SPINA BIFIDA.—This is a congenital deformity in which the halves of the neural arch have not met posteriorly at the base of the spinous processes. Normally the fusion commences at the upper end of the spine ; the neural arches have met posteriorly in the dorsal region by the end of the third month, but the lumbar and sacral regions are later. Hence, in children born alive, spina bifida is more common in the sacral and lumbar regions.

The condition is associated with a hernia of the membranes through the defect, and the tumour may contain membranes and cerebrospinal fluid only, or membranes and nerve-tissue with fluid. A tumour low down in the lumbar region may contain spinal cord in addition to nerve-roots, the lower end of the cord having been tethered by the abnormality in development.

An external tumour is not always present. The non-fusion of the neural arches may be indicated externally by a tuft of long hair, or by the presence of a lipoma in the mid line, but in spite of the absence of the external tumour, the implication of nerve-elements may be severe. The fact that the infant has club-feet as well as spina bifida does not prove that the former are due to the latter. It is quite common to see ordinary congenital club-foot (non-paralytic) in association with spina bifida.

The diagnosis is usually simple, and the prognosis depends on the nature of the covering, the associated deformities, the nature of the tumour contents, and the general condition of the child.

TREATMENT.—Many cases are not suitable for any treatment. The tumour may be covered with granulation tissue and exuding cerebrospinal fluid, and the only thing to do is to keep the area as clean as possible while awaiting the result of the septic meningitis and the enfeebled condition of the infant.

Should the tumour be covered with epithelium, it should be protected with a large shield with perforations. Unless the tumour be comparatively small and the skin covering of good quality, any form of pressure on it is to be strongly deprecated. If the tumour be increasing rapidly in size, it should be aspirated. The puncture should be made through healthy skin some way from the tumour, so that the track of the needle is a long one. The aspiration must be done slowly, and the infant kept recumbent

for twenty-four hours. Should the child apparently be going to survive, the sooner any associated deformities of the feet are brought under treatment the better.

In infants who have survived the first few weeks, there are two operative measures : (1) Injection ; (2) Removal of the sac.

1. *Injection.*—The object of the injection is to induce sclerosis and contraction of the sac, and possibly finally its complete obliteration. The tumour is first diminished in size by aspiration, and then 30 to 100 minims of Morton's fluid (iodine 10 gr., potassium iodide 30 gr., glycerin 1 oz.) are introduced. The child should be kept recumbent, with the site of the needle-puncture uppermost. It has seemed to me that the introduction of the irritant has been followed by increased formation of fluid rather than sclerosis of the sac, and there is a mortality of 20 per cent from the operation, but the treatment should be tried, especially if the tumour is apparently a simple meningocele

2. *Removal of the Sac.*—This is a sound method if there is enough healthy skin to cover the site at the close of the operation. The incision should be transverse, so that it does not coincide with the line of deep stitches. Any nerve-elements should be carefully preserved, and every attempt made to close the sac over these. It may be a very tedious operation in a young child, so that every precaution against shock should be taken. The deficiency in the neural arches has been compensated by a bone-graft.

I have explored several cases of spina bifida occulta, in young adults with paralytic symptoms, with no benefit and no ill results. *Robert Milne.*

SPINAL SYPHILIS.—(*See* SYPHILIS OF THE NERVOUS SYSTEM.)

SPINAL TUMOURS.—Neoplasms of the vertebræ, the spinal membranes, and of the cord itself, produce their major effects, and ultimately if left alone prove fatal, from secondary complications due to interference with the conductivity of the cord. The majority of such tumours of the vertebral column are malignant in character, being primary or secondary sarcomata, or secondary carcinomata. For these little can be done, either surgically or by any other means. The intramedullary tumours, too, are usually malignant ; whilst those arising in the membranes, whether intrathecal or extrathecal, are more often benign. It is in this last-named class that surgery has achieved some of its most notable triumphs.

The diagnosis of malignant disease of the vertebral column rests upon the evidence of the local bone pain, root pains, rigidity and deformity of the spine, and often the presence of primary cancer elsewhere, together with symptoms of rapidly increasing pressure upon the cord. When no primary growth exists elsewhere, it may be difficult to differentiate from tuberculous caries ; so that in some cases an exploratory operation is demanded. Relief, by laminectomy, of pressure upon the cord and upon nerve-roots, especially in the case of tumours affecting the cauda equina, may prolong life for many months and abolish pain.

Meningeal tumours produce a clinical picture which is often unmistakable, though other lesions, particularly meningeal cysts, are capable of giving rise to a similar train of symptoms. The picture is that of a steadily progressive transverse lesion of the cord, the level remaining constant and precise. It is not always possible to distinguish with certainty between intramedullary and extramedullary tumours. It is not possible to distinguish clinically between intrathecal and extrathecal tumours. The extramedullary tumour is most frequently intrathecal ; it may extend over several segments of the cord ; it is generally attached but loosely to the meninges, and lies in a cuplike depression in the cord. Complete exposure, by removal of several laminæ, is an essential step in the operation, for working with an inadequate opening is likely to be followed by damage to the cord. Once thoroughly exposed, the tumour can be lifted out of its bed with little difficulty, and as a rule with but trifling hæmorrhage.

When the tumour is intramedullary, a median longitudinal incision into the cord may be made, so as to evacuate a cyst, or, if the tumour is a solid one, to allow of its spontaneous extrusion ; in either case, the pressure on the overlying cord tissue will be relieved.

The after-treatment is of the greatest importance. The patient must lie upon a water-bed, and receive the most assiduous attention directed to the prevention of bed-sores. Urotropine or helmitol should be given ; this, together with regular catheterization and

bladder washing, should prevent, and will certainly minimize, the dangers of cystitis and pyelitis. Care must also be exercised in the prevention of postural deformities, by the use of suitable splinting and passive movements of the joints. Massage should not be employed when spasticity is present.

The prognosis depends primarily upon the simple or malignant character of the tumour, and the completeness with which it can be removed without further damage to the cord; whilst the rapidity and extent of recovery depend chiefly upon the degree to which the cord has already been damaged before operation, and the effectiveness with which the after-treatment is carried out. *Percy Sargent.*

SPINE, CARIES OF.—We are concerned here only with tuberculous disease of the bodies of the vertebræ, for tubercle attacks other regions of the spinal column very rarely in comparison. Radiographs have become increasingly useful both in diagnosis and in estimating the progress of the disease and the process of cure. The commonest site for caries is the lower dorsal region, and fortunately a lateral view of the bodies in this region is readily obtained; such a view shows the presence, the extent, and the progress much more completely than an anteroposterior view of the spine. It is not possible to get good lateral views of the bodies in the upper dorsal region and in the lumbosacral region, and here we have to depend on stereoscopic views for as much information as we can get. It has been estimated from statistics that 95 per cent of cases have an angular deformity when they come for the first time. Ménard has shown that, in the cervical and lumbar regions, one body can be completely ablated with no deformity, and therefore we must conclude that in a case with deformity the amount of bone destruction is at least equal to the loss of one body. It is not rare to find cases, recent cases, coming for the first time with a couple of bodies destroyed, with an abscess showing in the *x*-ray plate, and therefore with a condition more advanced than is commonly pictured in an orthodox text-book description. On the other hand, by means of the lateral radiograph we may be fortunate enough to detect an early local focus in one body before there is any deformity.

General Principles of Treatment.—The tubercle bacillus has been carried to the vertebral bodies by the blood-stream, there has been a systemic infection, and therefore we must use all the means at our disposal to build up the systemic resistance, in addition to the treatment of the local caries. The general treatment consists in a maximum of open air, an abundance of plain nourishing food, sunshine, and cod-liver oil. In hot weather Parrish's food may be substituted for the cod-liver oil.

Apart from these general measures, the correct treatment for caries of the spine is absolute and uninterrupted rest, and I have no hesitation in saying that this can best be secured in the majority of cases by operative measures. The commonest sites for the disease are the lower dorsal region and the lumbar region. It is true that the patient can rest in bed, or in various forms of apparatus applied externally to secure fixation, but none of these really secure absolute fixation to the segment of diseased spine. The dorsal spine moves with respiration; this is very obvious when the spinous processes are exposed for any operation on the spine; and the only method of absolute fixation is to copy one of nature's methods of cure—viz., to ankylose the spinous processes or the laminæ of the diseased segment together and to the healthy vertebræ above and below. The methods in use are two—either Hibbs' operation, or bone-grafting as devised by Albee.

Hibbs' Operation.—This consists in: (1) Baring the spinous processes of periosteum, performing a hemi-section at their bases, and turning each one down so that it lies in contact with the bare spinous process below; (2) Chiselling off from the lower border of each lamina a small flap which, when turned down, lies on the dorsal aspect of the lamina below. Both these processes are much facilitated by the use of the special forceps and the special chisel designed by Hibbs, and the result is a bony ankylosis of the neural arches of the affected segment, ankylosing them together and to two healthy vertebræ above and below.

The operation can be done however sharp the angular deformity. It rounds off the angularity, and gives an improved spine from a cosmetic point of view. But it has a small margin of error. Supposing we are aiming at ankylosis between seven neural

arches; then successful ankylosis between the upper four, and between the lower three, with failure of ankylosis between numbers four and five, will negative the absolute fixation which is our 'idea' in operating.

Bone-grafting.—The operation devised by Albee consisted in splitting the spinous processes and the supraspinous ligaments of the affected vertebræ and two healthy vertebræ above and below, and placing in the bed thus formed a bone-graft of living bone taken from the patient's tibia. Practically the spinous processes are split into unequal portions, in such a way that the larger portion remains with its attachment to the laminæ intact and yet a fresh raw bony surface gives out a supply of bone-cells which give bony union to the graft in three weeks. The graft has been laid on the posterior surface of the laminæ denuded of periosteum, but this does not seem to be such a favourable bed to provide rapid bony union.

The bed is always prepared before the graft is taken from the tibia, so that it may be dry when the graft is placed into it. No foreign unabsorbable material is needed to hold the graft in position; this is done by suturing the spinal muscles over the graft in its bed. In some cases I have used the anterior border of the tibia, in others a graft from the internal surface; the anterior border is the stronger, but the internal surface provides more bone-cells to facilitate the bony union. The operation is sound in theory; it is very sound in practice. Cases which I did over seven years ago have remained perfectly well since; one of these tested the result by being run over and fracturing his spine through his old caries, with no recrudescence of the disease; a second (a lumbar case) has had two children, with no trouble—and pregnancy is a very severe test for lumbar caries,—she having had a large psoas abscess when I bone-grafted her spine; while a third recently came to see me wearing khaki. If the grafts are inserted in children, the spinous processes keep their original relationship to the bodies, and this is possible by the grafts increasing in length as the spine grows with the child.

There is no shock associated with the operation, in spite of the patients being sometimes poor operative risks. There has never been any trouble with the tibia afterwards.

The bone-grafting operation provides for a margin of error. Supposing ,again, seven vertebræ have to be ankylosed together, even if the graft unites to number one and number seven only, we have ankylosed by bone that diseased segment of spine, and can confidently look for cure. With ordinary care there is no reason why any spinous process should be missed in the ankylosis, but the failure of bony ankylosis in one does not negative the success of the operation.

After-treatment.—In the case of adults, the patient is nursed for three to four weeks in a box-splint after the operation. A plaster jacket is applied in the prone position, and if possible he goes to the country or seaside for a month. The plaster is worn for three months, and is then replaced by a celluloid jacket for safety. In addition to the examination by clinical means for any signs of active mischief—pain, tenderness on percussion, malaise—the spine must be examined by radiographs before the celluloid jacket is fitted, and the return of well-defined bony structure in the altered bodies seen before cure can be claimed.

In the case of infants and very young children, plaster jackets are unsatisfactory. These are placed, after three weeks in a box-splint, either into a double Thomas's splint with head and feet extensions, or on to a Bradford's frame. This latter is the more commonly used, on account of its cheapness, and the fact that hyperextension of the spine is possible. It is a frame made of gas-piping, the length about a foot longer than the child, the width equal to the distance between the child's shoulder-joints, and canvas fills in the interior of the rectangular frame. Pads are sewn on the canvas to prevent any risk of the gibbus pressing on the canvas. The trunk of the child is controlled by a corset applied over it and fixed to the frame, and the lower limbs are controlled by webbing straps crossed over the ankles and knees. For the use of the bed-pan, the mother or nurse is instructed to loosen the leg straps and flex the thighs at the hips, the head end of the frame being elevated at the same time on a chair. I have usually kept young children on the frame after operation for six months, but it is a moot point whether this is necessary. One or two went straight from hospital to infirmary, where they were allowed to get about at once, with no ill effects.

Adults bear recumbency badly, whether they be of the leisured class or workers.

The operation of bone-grafting provides a much more certain cure with no recumbency, except immediately after the operation, than recumbency in a splint for at least twelve months. There is a risk, of course, associated with every operation ; but both in adults and children the risk is so small that it is worth the result. Again let us emphasize the necessity of general systemic treatment as well as the operative treatment, and it is advisable to continue this for a period of twelve months after the operation. It is hardly necessary to say that attempts to remove the diseased bone and tissue by costo-transversectomy are not justifiable in view of the excellent results by other treatment.

Splints and Apparatus.—Failing consent or advisability for operative fixation some form of external apparatus must be employed. While the disease is active, recumbency is necessary ; and while the apparatus is being made, the patient may be put into a double box-splint with extension. In recent cases a good deal of the gibbus will disappear with this rest and extension, and, on the whole, it is better to follow it by a Bradford frame. Both the frame and the double Thomas's splint, with head and feet extensions, give rest to the spine, but the fact that the frame can be bent into hyper-extension enables it to have a more corrective influence on the amount of deformity. If the disease extends above the 6th dorsal vertebra, the head must also be fixed in whichever apparatus be used.

The splint or frame must be worn for at least twelve months after all pain has disappeared. This is the absolute minimum, and it is well to warn the patient or the parents of the child that it is a matter of years, and that a year's recumbency in the splint is the absolute minimum. Each patient must be treated on his merits, a case with a large abscess, for example, being kept recumbent for a couple of years. At the end of this time, if no signs of activity have been elicited for months, then the child can be slowly restored to the vertical, commencing by raising the head end of the frame each day for an hour at a time. In the meantime a celluloid or poroplastic jacket is being made accurately to fit the child, and this is gradually substituted for the frame and recumbency. It takes three months at least to get the child on to his feet in the jacket for the first time.

Should the disease extend above the 6th dorsal vertebra, the recumbent position should be maintained three months longer than when the disease is lower down, and the jacket must come well up under the mastoid processes and the base of the skull posteriorly. It is not wise to support the head by any pressure under the lower jaw, and the apparatus must give its support through the mastoid regions, and must prevent all rotation of the head. During the whole of the period of recumbency, and for years afterwards, the child should continue its systemic treatment of open air, sunshine, and cod-liver oil.

Abscesses.—The mere presence of an abscess in connection with caries of the spine is no indication for interference with the abscess. The best treatment is to aim at removing the primary cause—viz., the activity of the bone disease. Radiographs have revealed that abscesses due to caries of the spine are commoner than was supposed, and it follows that before the introduction of x rays many unsuspected abscesses did very well simply with treatment of the spine. The mere fact that the abscess can be detected by ordinary clinical examination does not alter the treatment.

Should a palpable abscess increase in size before the spinal disease can be brought under control, then it should be aspirated. This operation is done with a large-bore needle after previous puncture of healthy skin by a tenotome. The track of the needle into the abscess should be as oblique as possible, and the actual point of entry should be in the upper, rather than the lower, part of the abscess, with the patient recumbent. The introduction of antiseptics after the aspiration leads to irritation of the walls, with increased exudation, and therefore as a routine measure is to be avoided. Simple aspiration may easily have to be done repeatedly, but it is safer than an open operation in the presence of active spinal trouble.

Abscesses in connection with cervical caries may provide an exception when the collection is retropharyngeal. For the sake of the respiratory obstruction, these may have to be opened. The incision is at the posterior border of the sternomastoid, with every possible precaution against sepsis ; the lining membrane is wiped out with gauze on holders, and the wound is sutured completely.

There are cases in which, after the spinal disease is quiescent, the dried-up abscess

behaves as a foreign body and the effusion recurs. The collection may then be treated by open operation with very little risk of the bone becoming infected, as the incision heals permanently by first intention. For a psoas abscess the best incision is by a gridiron route in the iliac fossa; the lining membrane is treated as in a retropharyngeal abscess, and the incision is sutured in layers. Scraping with a sharp spoon is unnecessary, and opens up fresh paths of infection, while the application of antiseptics leads to increased effusion and so endangers the healing by first intention which is essential. It is hardly necessary to state that a drainage tube should never be used in a spinal abscess.

Paraplegia.—In adults especially, paraplegia may be the symptom which leads the patient to seek medical advice, and in the majority of cases the symptom is due to the pressure of granulation tissue or pus outside the dura. It may be due to a transverse myelitis, to hæmorrhage into the cord, or even to direct bony pressure on the spinal membranes and cord, but all these are rare. The symptoms come in the following order: (1) motor, (2) sensory, (3) sphincters; it may be assumed, therefore, that when the sphincters are involved the case is a severe one.

The best treatment is rest in a splint with extension. The fact that such a large proportion of paraplegic cases show the disease in the dorsal region, where the amount of spare room for the cord in the spinal canal is so little, makes one rather hesitate to urge bone-grafting as an immediate treatment. The operative manipulation might conceivably lead to a small hæmorrhage in the tissue, with bad results. The symptoms of paraplegia will clear up with rest and extension, care being taken in the meantime to prevent wasting of the muscles by massage, and the occurrence of deformities. The paraplegia may take months to disappear.

Laminectomy has been done; it entails the removal of the neural arches of the segment of spine affected. The disease has already removed most of the bodies in front, and hence there can be left very little organic support for that segment. The operation is a severe one; it has been followed by dissemination of tubercle; and a case of paraplegia which does not clear up with rest and extension is probably associated with one of the rarer pathological conditions which give rise to it, and these conditions are not such as will be benefited by laminectomy. The operation therefore can never be urged, and is very rarely to be advised. *Robert Milne.*

SPINE, FRACTURES AND DISLOCATIONS OF.—The bony spinal column may suffer injury in three ways: (1) From direct violence; (2) From indirect violence due to falls on the feet or head causing compression of the vertebral bodies; and (3) The result of overflexion or overextension. These may cause fracture, dislocation, or fracture-dislocation. The 4th, 5th, and 6th cervical, the 12th dorsal, and the 1st lumbar vertebræ are those most often involved.

Fractures of the Spine are important on account of their complications. So far as the bony lesion is concerned, the treatment adopted for fracture elsewhere is indicated. But in the large majority of instances the spinal cord is irremediably damaged. The treatment, therefore, consists chiefly in the skilful management of a patient with a transverse lesion of the spinal cord.

Fractures may be divided into the complete and the incomplete; the former into those associated with dislocation and those without, and, what is far more important from the point of view of prognosis and treatment, into the complicated, in which a lesion of the nervous system exists, and the uncomplicated, in which this is absent. Although the complete and the incomplete correspond closely to the complicated and the uncomplicated, yet it must be remembered that a complete fracture by no means always leads to complications of a nervous nature. Several cases of fracture of the 5th or 6th cervical vertebra have come under my notice, in which no suspicion of the nature of the injury was aroused at the time of its infliction, but the patient came under observation later on account of persistent stiffness of the neck. The physical signs pointed to fractured cervical spine, which was confirmed by the radiograph. In the compression fractures, in which the bodies of one or more vertebræ are crushed as the result of falls upon the feet, buttocks, or head, there may be no nerve symptoms. This fracture is not usually recognized at the time of the accident, but the pain and deformity which may develop later bring the patient under observation. At this time it may be difficult to

distinguish it from tuberculous disease of the spine without *x*-ray examination. Again, certain cases of incomplete fracture may cause injury to the spinal cord, e.g., fracture of the laminæ.

Examination.—This must be conducted to discover the extent of the damage to nervous structures, the level at which this has occurred, and finally, the nature and degree of the bony injury.

If nerve injury be absent, the greatest care must be taken to avoid its production; if existing, to guard against aggravating it. The examination should proceed in an orderly manner, the condition of the muscles being first investigated, then sensibility, and finally, the condition of the bladder. The diagnosis of complete or incomplete interference with conduction is made from the condition found. The examination of all cases in which the continuity of the bony column is destroyed must be gentle; the patient must not be turned in bed to ascertain this. In most cases passing the hand beneath the patient's back at once reveals the nature of the injury, kyphosis with irregularity of the spinous processes being present.

Incomplete Fracture.—A spinous process, or one or both laminæ, may be fractured, usually as the result of direct violence. Few of these cases are complicated, but they require careful and in many cases prolonged treatment. Considerable laceration of the soft parts is inevitable in all cases, and also extradural hæmorrhage in fracture of the lamina; this may cause pressure on the cord, or the pressure may be due to depressed bone when both laminæ are fractured.

After deciding that no indication for operation is present, the patient should be kept at rest in bed. Pain is best relieved by hot applications, and all pressure on the seat of the injury is to be avoided. In about a week massage may be employed, but no active movements until pain has ceased. In many cases five or six weeks' rest is necessary.

For persistent pain in old cases, counter-irritation by the actual cautery or blisters often gives relief, and it may be necessary to employ passive movement to break down adhesions, after excluding other causes of rigidity, such as traumatic spondylitis and tubercle.

Operation is indicated in bilateral fracture of laminæ, or for extradural hæmorrhage. In the former case, after exposing the seat of the injury by means of a vertical incision or raising a flap, great care must be taken to avoid any pressure on the cord. The laminæ must be raised with care by seizing the spinous process with forceps. Search should be made for loose spicules of bone or a laceration of the dura mater. The lamina should not be replaced.

Complete Fracture and Fracture-Dislocation.—In the examination of a case of injury to the spinal column, with signs of pressure on the spinal cord or nerves, in addition to the points already mentioned we must ascertain at once if the case is one needing operative treatment. Care must be taken that fracture of the lamina with depression is not overlooked; in these cases operation should be carried out at once. Unfortunately, in the large majority of cases the injury to the cord is inflicted at the time of the accident, and from its nature is irremediable by operation; the symptoms are not due to bony pressure.

Considerable difference of opinion exists with regard to the cases in which operation should be done. All will agree that injuries involving nerve structures below the level of the termination of the cord at the lower border of the first lumbar vertebra should be submitted to operation. But there is a difference of opinion as to the time at which this should be carried out. In lesions of the cauda equina, exploration should be undertaken as soon after the accident as possible; we should not wait for six weeks to see if the lesion will be recovered from spontaneously; if this is done the difficulties of the operation are much increased and the prognosis is less favourable. In cases first coming under observation some weeks or months after the accident, the rules governing the treatment of injuries of the peripheral nerves apply: exploration with suture if possible; if this cannot be carried out, nerve anastomosis.

Where the symptoms point to partial interruption of conduction in the spinal cord, if there is any suspicion that this is due to bone or a foreign body, or if it has appeared or increased in extent since the accident (hæmorrhage), operation should be carried out.

It is in the cases of complete interruption of conduction in the spinal cord that

divergent opinions have been expressed, some surgeons considering that the patient should be given a chance by operation. For example, Scudder, in his book on the treatment of fractures, takes up the advanced position that "all fractures showing complete transverse lesion of the cord should be treated by immediate operation. Profound shock requires reasonable delay only". The experience of most surgeons, however, coincides with that of Cushing, who writes, "It is an unjustifiable ordeal for both patient and operator".

If called to see the patient at the time of the accident, transport to the patient's home or to hospital must be so arranged as to avoid inflicting damage on the cord or increasing any existing injury. After the diagnosis has been arrived at, no attempt should be made to disturb the patient until everything is ready for his removal. A firm stretcher should be used, a shutter or hurdle answering the purpose if one cannot be obtained. Lifting must be performed with the utmost gentleness, and extension should be made by assistants while the surgeon supports the injured part.

Before the patient is moved from the stretcher the bed must be prepared, and the patient lifted under the care of the surgeon. In hospital this duty must not be left to the discretion of the porters and nurses. The bed must be prepared with fracture boards and the fracture mattress, its central portion consisting of two halves which can be removed for the attention necessary from time to time. The patient should be placed on his back with his legs flexed over a pillow. A water-bed is not advisable for a few weeks.

Shock must be combated in the usual way, and care taken that the hot bottles do not come into contact with skin devoid of sensibility. The bladder must next be attended to: if it is distended, a rubber catheter should be passed. Great care should be taken to avoid infection; the catheter must be boiled, and no catheter used that cannot be disinfected in this way; the hands of the surgeon must be rendered as sterile as possible. After the bladder has been emptied, the penis should be wrapped in antiseptic gauze.

In the large majority of cases the deformity reduces itself when the patient is placed flat on his back; if there is deformity, it must be rectified by extension under chloroform anæsthesia. The question of immobilization next arises. In fractures in the lower dorsal region, a carefully applied plaster-of-Paris jacket should be employed, but in higher fractures it is unwise, on account of the amount of the respiratory embarrassment produced. Extension by means of weights and pulleys is almost impossible to carry out if a cord lesion is present, on account of the injury caused to the anæsthetic tissues by the necessary strapping, etc., but if it is absent this is the most favourable method of securing immobilization.

If no cord lesion is present, the patient must be kept on his back for six or eight weeks, and then allowed up with his back supported by a poroplastic jacket. With cord injury, the treatment now resolves itself into combating complications, the most formidable being bed-sores, cystitis, and pyelitis.

The treatment of bed-sores is preventive, and skilful nursing under the direct supervision of the surgeon is necessary. The skin exposed to pressure must be kept dry, and after washing with soap and water, at least once a day, spirit lotion is applied and the parts are dusted with boracic powder. All pressure must be as far as possible avoided, and after about three weeks a water-bed may with advantage be substituted for the fracture mattress. If a bed-sore appears, dry antiseptic dressing will be found useful in most cases; in others boracic acid or eucalyptus ointment may be substituted. The ulcer should be surrounded with a water-pillow or a circle of thick plaster to avoid all pressure. The greatest care must be taken with the dressing to avoid infection; when this occurs, fomentations should be substituted.

Retention of urine must be treated by regular catheterization with aseptic precautions. True incontinence is rare, and in these cases care must be taken to secure the sterility of the urine bottles. But in spite of skilful attention, cystitis followed by pyelitis is almost inevitable. For this reason perineal or suprapubic drainage of the bladder has been advocated as a routine treatment in these cases.

Dislocation of the Spine.—Dislocation unaccompanied by fracture is limited to the cervical region, and takes place usually between the fifth and sixth vertebræ. It is commonly unilateral, and caused by a fall from a horse, or similar accident. It may be

overlooked at the time of the accident, and occasionally the patient does not seek advice until some time has elapsed. The appearance of the sufferer is characteristic. The head is turned to the side opposite the lesion, flexed towards the side dislocated, and fixed. The muscles on the affected side are relaxed. It may be associated with injury to the roots as they pass out of the foramina, and corresponding lesions caused; hæmatomyelia also may occur as the result of the injury, but any injury to the cord is uncommon.

Reduction should be at once attempted under an anæsthetic. The head must be bent laterally and somewhat backwards towards the side opposite the lesion, in order to free the articular process which has passed in front of that of the vertebra below. The head is then rotated so that the face looks towards the side of the lesion. If the injury is bilateral, reduction should be attempted in the same way; after one side has been reduced, a similar manipulation is done on the opposite side. Failing reduction by manipulation, open operation must be resorted to. The seat of the dislocation must be exposed; in most cases it will be found necessary to excise the superior articular process of the vertebra below.

In old cases, reduction by manipulation may be cautiously tried, but no force used; if this fails, open operation must be performed if much disability or pain exists, but some cases seem to be little affected. After reduction, a poroplastic support should be worn for at least two months. *James Sherren.*

SPINE, LATERAL CURVATURE OF.—(*See* Scoliosis.)

SPLEEN, WOUNDS OF.—(*See* Abdominal Injuries.)

SPLENIC ANÆMIA.—Under this name a great number of probably very diverse conditions have been included, and it will hardly be too much to say that every anæmia which is associated with enlargement of the spleen has at one time or other been classified under this title. The first broad distinction which must be made is between the splenic anæmia of infants and children, and that of adults.

Splenic Anæmia of Children.—It must not be forgotten that almost every anæmia in childhood is apt to be associated with enlargement of the spleen. In fœtal life the spleen is a blood-forming organ, and there is every reason to believe that under the stress of anæmia it resumes this function, while it retains its function of destroying the imperfectly formed anæmic corpuscles, and this double increase in function is associated with enlargement of size. It is extremely common to find that rickety, anæmic children—and almost all rickety children are anæmic—have large spleens. The measures advisable for the rickety state will be found to have good effect also on the anæmia and the size of the spleen. One often, however, finds children who are not rickety who are yet intensely anæmic and have large spleens. It is sometimes extremely difficult to come to an exact diagnosis of the blood condition in these cases. Some of them present a picture of pernicious anæmia with more or less accuracy, for in very early life the blood easily reverts to the fœtal condition, which is closely allied in appearance to that associated with pernicious anæmia. In others, the blood picture is not unlike that of an early lymphatic or myelogenous leukæmia, and cases of this sort have been classed as anæmia pseudo-leukæmia infantum. In others again, especially in older children, the blood picture is that of a secondary anæmia. All such cases should, of course, be treated by nourishing food, and by due attention to excretion of all kinds. As regards more special treatment the rule should be to give iron in all cases, and to give it in large doses; the actual form matters little. Children take the saccharated carbonate well, and it may be given in doses of 20 gr. and upwards. If this is not well taken, reduced iron, or almost any of the pharmacopœial preparations, will do. Should these not be successful, some of the organic irons which have lately been put on the market may be tried, but they are not usually so satisfactory. In cases where the colour index is high—that is to say, where the blood approaches the type of pernicious anæmia—arsenic should be given in addition. *X* rays are of no service.

Splenic Anæmia in Adults.—There are many conditions in which enlargement of the spleen occurs whose terminal stages are anæmic, and these are often spoken of as splenic anæmias. Pernicious anæmia in a fair proportion of cases is associated with enlargement

f the spleen, sometimes to a considerable extent. Primary splenomegaly, though it may ersist for years without anæmia, very often shows it in the late stages. Cirrhosis of the ver occasionally produces sufficient splenic enlargement to have been classed with this isease. Banti's disease is in similar case, while malarial cachexia, primary tumours of he spleen, terminal stages of pseudo-leukæmia, suppurating hydatid, etc., must all be ifferentiated before a diagnosis of splenic anæmia can be arrived at. The recently escribed condition of leukanæmia, if it is a real clinical entity, must also be borne mind. This is a very rare disease of fairly rapid course, where the symptoms are those f a steadily advancing anæmia with enlargement of the spleen; and the blood picture at first that of pernicious anæmia, to which later the condition of leukæmia is super-ided. When all these conditions are excluded, however, there still remains a group of ases with a progressive secondary anæmia, and with enlargement of the spleen, for which o cause can be found during life. It is extremely doubtful whether the enlargement of he spleen is more than a symptom, but the cases are not very numerous and have not een very fully worked out. The treatment must be on the general lines suitable to any condary anæmia: the administration of iron, rest in bed, and the use of the *x* rays in der to reduce the size of the spleen where that is causing pain or discomfort. In veral of my cases the spleen returned to the normal size, and the blood became rmal, with *x*-ray treatment, and radium is even more useful. Splenectomy may be ied provided the anæmia is not too great, for in Banti's disease recovery has followed e operation. In 32 cases of Banti's disease collected by Armstrong (*Brit. Med Jour.*, ov., 1906), the operation was fatal in 9 (28 per cent); in 22 there was complete covery; in 1 only was the condition unrelieved. The possible causes of death from e operation are hæmorrhage at the time, gastric intestinal hæmorrhage after a few days, eumonia, or vague gastro-intestinal symptoms some months after the operation. uring the last few years a large number of cases of Banti's disease have been treated by lenectomy, with, on the whole, encouraging results. The blood may return to normal, d the general condition of the patient improve greatly. In fact it has become almost the le to remove the spleen in these cases. It must be remembered, however, that there e often numerous adhesions, which greatly increase the difficulty and danger of the eration. I prefer to use *x* rays or radium in the first place; if these fail, or there recurrence, which will not yield to radiation, then consider operation. The theory derlying the procedure is that the toxin causing the disease is located in the spleen, d is removed along with it. *G. Lovell Gulland.*

SPRAIN-FRACTURE AND SPRAIN-DISLOCATION.—(*See* SPRAINS.)

SPRAINS.—The treatment of sprains depends upon the nature and severity of the jury, and upon the particular joint or muscle affected; but certain principles in their anagement are common to all. Our first aim should be to check or limit extravasation; er this to promote its early absorption; then to obtain satisfactory healing of the jured ligaments, muscles, or tendons; and finally to restore the normal movements to eir fullest degree.

For the purpose of classification sprains may be divided into two large classes: (*I*) *Articular*; (*II*) *Muscular*. The former are concerned with injury to the joints themselves, the latter with the over-stretching, dislocation, or rupture of muscles and their tendons.

I.—ARTICULAR SPRAINS.

Articular sprains may, for clinical reasons, be arranged into two divisions or classes: (1) *Simple*; (2) *Complicated*.

1. Simple Sprains.

These are cases where, as the result of some external violence, the soft parts are over-stretched or torn across, and in which no gross lesion of bone is found.

In the simplest form of sprain, that known as *strain*, the soft parts are merely over-stretched, and there is no true laceration. No swelling is found, nor does it ever supervene; the symptoms are merely those of pain, stiffness, and some loss of function.

In the more severe forms, in which there has been tearing as well as over-stretching, we get swelling in addition to pain and loss of power. When the swelling comes on immediately, it is due to hæmorrhage; when later, it is merely due to serous effusion (deferred swelling).

Strains.—In this, the simplest form of sprain, in which pain and stiffness are the chief symptoms and in which there is no swelling, the patient usually seeks advice for the relief of pain, which may be intense. Absolute rest to the injured part is the first indication for the relief of pain, and this is best attained with the aid of strapping. Any resilient, though elastic and strong material, such as wash-leather strapping, will serve the purpose. Many of the commercial forms of plaster are convenient and useful, providing they are smoothly, accurately, and carefully applied. As soon as pain ceases or is distinctly lessened as the result of the strapping, gentle stroking massage may be employed twice or even oftener in the day. The plaster need not be removed for this purpose, the massage being applied over it. This plan will usually reduce the pain. *Slight voluntary movements* should be encouraged from the first as soon as strapping has been applied. By these means stiffness, the other prominent symptom of strain, is readily and speedily overcome, and the healthy physiological nutrition of the joint or muscle is promoted, with complete and early restoration to function.

Sprains with 'Immediate Swelling'.—Swelling as the result of hæmorrhage is usually well established before the attendant is called to the patient. If, however, the case is seen at once or early, an attempt should be made to arrest or diminish further bleeding. Applications of *heat and cold* are seldom of any real service, have certain disadvantages, such as difficulty in application, and are, besides, not often at hand. The most efficacious and at the same time the most readily applied remedy is *firm elastic pressure.* Elastic pressure is suitable for all cases of extravasation, whether of small or great amount, whether immediate or deferred. It has the advantage of being absolutely safe, easily applied, and of universal application; it ensures perfect rest; and, if used at once, distinctly diminishes or completely prevents those secondary effusions that so frequently follow. Furthermore, it promotes to a marked degree the rapid absorption of all extravasated materials, the next urgent requirement in the treatment of every variety of sprain. Thus, by ensuring rest, checking or limiting immediate bleeding, preventing, or at any rate diminishing, secondary effusions, and promoting the absorptions of all extravasated materials, it serves the double purpose of meeting the two first and all-important requirements—checking hæmorrhage and removing extravasations. When properly applied it takes the place of a splint, and ensures rest.

The principle of applied elastic pressure is simple. The pressure applied being greater than that of the blood-pressure, it checks oozing or bleeding from the wounded vessels and as the pressure exerted is greater than the pressure of the extravasated material in the tissues, it serves to disperse the local extravasations by driving the fluid contents again into the general circulation, whence they are eliminated by the emunctories. The same principle is at work in relation to the serous effusion which is generally poured out secondarily into the synovial cavities of large joints as the result of sprain. Personal experience bears out the statement that if elastic pressure is properly and immediately applied to an injured joint, the secondary effusion will be lessened to a certainty, if not entirely prevented, and to a far greater extent than when any other remedial measures are utilized.

Equable elastic pressure may be used for any form of extravasation or effusion, whether diffused or localized, whether of rapid or more gradual formation. It matters little whether the material is pent up within the capsule of the joint, or is more loosely collected in the intermuscular and intercellular planes of the trunk or extremities. The action is the same, and its service is invariably efficient.

If the knee is taken as an illustration, and if we suppose that, as the result of a twist, its capsule has become distended with effusion, that most of the swelling appeared immediately after the accident, and that it continued to increase more gradually for some hours afterwards, such a knee will be found to have assumed the posture of slight flexion. In this position the capsule attains its fullest capacity, and the surrounding muscles are relaxed so that the sufferer obtains the greatest relief.

This is nature's first attempt at procuring rest, the first requirement in treatment. To extend such a joint, and to fix it on a straight splint as is so often done, not only

iolates the principle of securing rest, but makes the patient very uncomfortable. *The mb should therefore be allowed to assume that position which is most comfortable.*

Method of Applying Elastic Pressure.—The limb being slightly flexed and the joint laxed, thick layers of cotton-wool or Gamgee tissue, rolled round or cut into shapes, are lapted to it, and so applied that a complete coating of at least one inch thickness attained. In regard to length, the material should extend for at least two inches above nd below the outside limitations of the capsular ligament. Over this thickness of aterial a strong roller bandage is tightly drawn; an elastic though resilient material, ach as domette or flannel, is all that is necessary. The bandage is drawn as tightly as ossible so as to compress the wadding to its utmost, and then fixed, so as to maintain and eep up the compression. The wadding should be smoothly applied and all creases oided, or the pressure will be distributed unevenly (*Fig.* 65).

For the first few days it is of decided advantage to remove the bandage, even twice twenty-four hours whenever possible. This enables the attendant to watch the local ondition and the swelling, and to note the progress or otherwise of the case. It has been und that those cases in which the intermittent relaxation and compression is regularly rried out progress more rapidly than those in which the pressure is maintained more ntinuously. When the bandage is removed the joint becomes flushed with fresh oxygen-ed blood, and on its re-application the ins and lymphatics are once more com-essed, so that their contents are emptied to the general blood-stream. The to-and-o flushing and depletion is most beneficial, th in improving the nutrition of the limb d in assisting absorption.

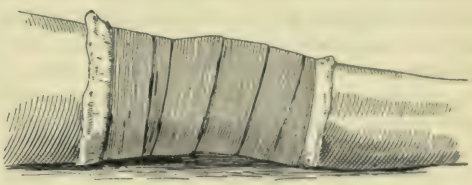


Fig. 65.—To illustrate elastic pressure applied to the knee.

In most cases the effusion will have appeared in from four to five days; but s result will depend largely upon the e at which treatment is commenced, and upon the care and attention that the endant is able to give in carrying out the details.

Massage.—The writer seldom or never now uses massage until all or most of the effu-n has disappeared. In ordinary cases, if it is properly and intelligently used, elastic ssure will effect all that massage can. Early massage often increases bleeding, and so ses delay. When large collections of blood are present in the tissues or joints, the ocess of absorption will take longer. It is in this class of case that massage combined h elastic pressure is more helpful. If the details in the application of elastic compres-n are carried out as here recommended, there will be neither complaints of discomfort r feelings of strangulation experienced in the limb.

Massage is seldom used before the fourth or fifth day, and not till the effusion has rly or quite disappeared. Gentle stroking massage is used for a few minutes after the dage is removed, and the bandage reapplied. If at the next inspection the fluid is l and there is no heat, friction massage combined with stroking movements is allowed; s breaks up coagula and hastens their removal.

A strong elastic rubber bandage should *never* be worn; it is uncomfortable, causes too ch compression, is hot, allows of no evaporation, and starves the joint of part of its od-supply.

Rigid splints and fixed apparatus, whether of wood, plaster, or other material, should *ver* be employed, even in complicated cases such as sprain-fracture. They are unneces-ry, are nearly always harmful, and lead to stiffness and atrophy. Having got rid of t effusion, our next care is to restore the strength and mobility of the joint in the shortest time. Weak, stiff, and painful joints result usually from the presence of adhe-ions within or around the capsule. Much wasting of the surrounding muscles is apt to llow the use of splints and fixed apparatus. This is a serious complication, and must beprevented.

Active voluntary movements may be allowed from the very beginning. However slightly made, they are of primary importance in preventing adhesions and muscle-wasting, and in maintaining the proper nutrition of the structures of the articulation. In most instances they relieve rather than cause pain; they should be permitted at

first only in those muscles that have escaped injury, and their range should be limited.

Passive movements are only mechanical in action, and possess little, if any, physiological merit. By stretching out the synovial membranes and capsular ligaments they may aid in restoring to their natural position fibres that are curled inwards and likely to form new and faulty attachments. They are not to be compared with active movements as regards their influence on nutrition and repair. The normal nerve-impulses, transmitted to the region of the joint through the muscles, will do more than any mechanical means such as massage and passive movements to restore physiological action and maintain the process of repair; and this is an important fact in dealing with any injured tissues.

Recurrent and Relapsing Cases.—When a distinct interval of hours or days occurs between the time of injury and the incidence of swelling, and in those cases where there is a recrudescence of symptoms after a period of apparent subsidence, the effect is probably due to *secondary inflammatory changes*. The treatment will depend upon whether or not there are present other signs of inflammation, such as pain on local pressure, heat, and increased tension.

In the absence of these acute symptoms, massage and movements may be used. Especially useful are gradually increased voluntary movements and exercises assisted by elastic compression. If there be pain and rise in surface-temperature of the part, whether of joint or other region, *all movements and massage should cease at once*, and reliance be placed entirely on elastic pressure. The amount of pressure should be regulated according to the comfort or otherwise that it affords. Cotton-wool and a crêpe Velpeau bandage will give all the support and rest required. It is notably in these cases that the use of splints is harmful. The discomfort of the splint leads the attendant to imagine that more complete rest is needed; and so the splint is retained for an indefinite period, with the result that adhesions form, muscles waste, and a painful, stiff, and crippled joint remains. These so-called relapsing cases are not infrequently associated with, and dependent upon, the health of the individual.

Those of a gouty, rheumatic, tuberculous, and even syphilitic tendency are subject to effusion into their joints, the injury being merely the starting and localizing cause. Hæmophilia must not be forgotten. It is of the greatest importance to make careful inquiry into the histories of all recurrent or relapsing cases, to search diligently and carefully for any other clue which may be corroborative of a suspicion as to a constitutional taint. In a large percentage of cases such taint will be readily found, a fact which will greatly influence our views of the local treatment and prognosis.

These constitutional cases must be treated, according to their nature, by general as well as by local means. In *rheumatism*, the salicylates are usually successful in relieving pain. With a history of *gout*, the iodides or even colchicum exhibited internally are useful, whilst vasogen-iodine is an excellent local application. In *syphilis*, small doses of mercury in pill are preferable to the depressing iodides; and salvarsan would seem to promise well. *Hæmophilia* requires absolute rest; in some recent cases, injection of horse serum was eminently and rapidly efficacious, and far outstripped any results formerly attained by prescribing calcium lactate and other drugs; fortunately this complication is rare. *Tuberculosis* as a sequela and complication is not unknown, and must never be lost sight of; personal experience teaches that it is not, however, as frequent as generally taught.

Tension in Joints after Sprains is a condition which may follow a joint injury immediately, or come on gradually some days or weeks later. The joint becomes distended to its fullest with a fluid effusion. When immediate, it results from hæmorrhage; when later, from secondary and inflammatory processes. Inflammation may follow local injury or any of the constitutional states (gout, rheumatism, etc.) already enumerated. Local heat is always a symptom of tension, but it may be so slight as to escape casual observation; as a rule, the more rapid the incidence of swelling, the more evident the heat locally. Pain, often constant, and readily increased by any form of movement, is complained of. This is often severe, and gives rise to sleeplessness, loss of appetite, and general irritability. In the more severe cases, one of two lines of local treatment is adopted:—

a. When there is no definite constitutional contra-indication, and in the absence of æmophilia, the severe pain will be relieved at once by aspiration under a general anæsthetic. An ounce or two of serum withdrawn is quite sufficient, and as a rule recovery ollows more quickly after *partial* removal of the contents than after complete and full ithdrawal. Partial removal, followed by elastic compression to the joint, will usually lieve pain at once ; and it will establish a condition suitable to rapid re-absorption of he effusion.

b. When aspiration or any other form of operation is contra-indicated or objected , the radiant-heat bath or diathermy should be tried. In a certain proportion of cases ot applications afford relief, though sometimes their effects are only temporary and lapses follow. When dry heat or diathermy is unobtainable, the old-fashioned applicaon of hot fomentations with laudanum or lead lotion may have a soothing effect. As on as the tension is subsiding, elastic pressure followed by gentle massage is indicated. long as pain and local heat remain, *all movements must be prevented.*

In the long-continued cases, and where there appears every prospect of disorganizaon or weakening of the joint from its prolonged distention, and subsequently from dvancing atrophy of the muscles, arthrotomy and digital exploration of the joint itself ay become necessary and even advisable. No open operation should, however, be ghtly considered or undertaken when the knee or shoulder-joint is concerned ; it is only t be adopted in the worst cases, after all other measures have failed, and where the joints ust otherwise be permanently damaged. Digital exploration will often reveal a troublesme adhesion, or other defect, productive of the whole mischief. To open the knee-joint, e clinician must be one who has the fullest confidence in his surgical technique ; for nless absolute cleanliness and thorough asepsis can be guaranteed, arthrotomy should ever be practised.

2. Complicated Sprains.

We may classify these as follows :—

a. Large collections of blood (hæmatoma) may form, owing to the lacerations of uscles and other soft tissues, and so complicate an otherwise simple sprain.

b. In a few cases nerve-trunks, or their branches, become injured, so that pain, resis, palsy, and even atrophy and neuritis, may supervene, and lead to crippling.

c. Sprains may be complicated with injuries to the bone or periosteum, as when rtions of bone or epiphyses are detached, or when the bones are fissured or even crushed (rain-fracture or fracture-sprain).

d. In the joints in which interarticular cartilages are found, as in the knee, these structures may become loosened or partially detached, torn, and displaced (sprain-dislocation).

A sprain complicated with injury to a bone, with displaced, torn, or otherwise ached interarticular cartilage, with gross nerve lesion, or with extensive extravasation, will require special and careful handling.

a. **Hæmatomata.**—Large hæmatomata, if superficially placed and if some distance from the joint, are best treated either by aspiration or by a free incision, with a removal of clots and immediate suture. Drainage is seldom required. Elastic pressure may be applied with advantage over the absorbent dressing. When the wound is healed, massage to the peripheral parts, avoiding the scar, will expedite the cure. Extensive collections of blood may form in the buttock and upper thigh, axilla, sheaths of recti abdominales, and psoas and iliacus muscles. In articular sprains the bleeding is generally arterial and from the periosteum, whilst in tears in muscles it is more usually venous.

b. **Sprains Complicated with Injury to Nerves.**—In the lacerations of muscles, as in the over-stretching of ligaments, nerves are injured. Nerve injury often escapes the attention of the surgeon at first, and may not be detected until quite late in the management of the case. When pain radiates along a nerve-trunk, or there is marked paralysis, nerve injuries do not escape notice as they do when small branches between the muscles of the trunk are over-stretched or torn. Numbness and tingling are indicative of pressure ; they usually pass off in about thirty hours, and are relieved by massage or the more direct removal of the pressure.

When pain radiates along the course of a particular nerve or group of nerves, absolute and complete rest is imperative. Massage and movements do positive harm,

and herein lies the difficulty in treatment. In simple sprains and strains, massage and movements are advocated, and fixation disallowed. In this particular complication *routine* movements and exercises, as recommended by the bone-setter, are the *worst possible treatment.* In this class, absolute rest must be given until the pain is subsiding or has disappeared, though not necessarily with splints. After this, gentle massage should be cautiously tried, and followed by graduated exercises. If the pain should be increased then movements must cease and one or other form of electrical treatment be used. Electric sparking and diathermy have each their advocates, and occasionally are of much assistance in diminishing or curing the pain. A good alternative plan to the employment of massage is the use of Bier's bandage, and in chronic cases it should be applied two or three times a day. At first progress is slow as a rule, but the pain subsides more rapidly later. The repeated and alternating flushing and depletion stimulates the local circulation and overcomes the local neuritis. In the more chronic forms resulting from neglect static electricity may succeed when massage fails. Blistering, and even the actual cautery, along the course of a nerve-trunk has been used to diminish the intensity of the pain. Opiates and similar drugs should be avoided in all such chronic cases. One of the most rapid and obstinate forms of wasting of muscles results from gross nerve lesion; it is more rapid, more complete, and more lasting than any of the forms that result from mere disuse.

c. **Sprain-Fractures and Fracture-Sprains.**—The treatment of this class differs in certain particulars from that of a simple sprain. With portions of bone detached, or fissured, or crushed, it becomes necessary to give sufficient rest to restore bony union. Elastic pressure is as useful for this purpose as in simple cases, nor is a splint usually necessary. Forcible passive movements *must be avoided*, or stiffness and delayed repair will result; whilst voluntary movements must be confined at first to remote parts and not allowed to play directly upon the injury. It is obvious that any force which will produce separation of fragments, or stretch early union in tissues unduly, will delay repair.

Passive movements will also be harmful unless very limited in their range. Whenever they cause pain they must be discontinued. The teaching that *passive movement and massage* are the correct line of modern treatment in fracture-sprains has led to much mischief; many joints have been made permanently stiff because the attendant, in his anxiety to carry out this teaching, has overdone the movements, and has increased callus formation. The practice of passive movements should be as limited as possible, and used mainly to put the particular joint through its various movements *once*; and whenever this causes pain it should be desisted from and not repeated. When pain is complained of, passive movements do harm rather than good. Voluntary movements and more regular exercises are of greater use later in the case—that is, after union is complete. When there is fracture without separation, as in fissures in the lower tibia or fibula or in the metacarpals or small carpal bones, and where there is but slight effusion, strapping as for a simple sprain is convenient and sufficient. The main difference between the treatment of simple sprains and that of sprains complicated by fracture is that, in the former, voluntary or active movements are permitted and encouraged from the *early stages*, and are essential to speedy recovery; in the latter, they must be secondary to massage and gentle passive movements, and allowed only in the later stages. Massage is valuable in both classes and, speaking generally, may be begun early. In simple sprains, passive movements are of secondary importance; whilst in those complicated with fracture, they are, perhaps, of greater service than voluntary exercises; especially is this true of the early treatment; active exercises are helpful to both classes in the later stages.

In every case in which there is reason to suspect bone injury, a radiogram should be taken; otherwise a mistaken diagnosis may be made, and unsuccessful treatment result.

d. **Sprain-Dislocations.**—The treatment of sprains complicated by the presence of loose bodies in a joint is often troublesome. Relapses are frequent. Recurring attacks of synovitis are likely to supervene from time to time, producing inconvenience and disability. Whenever the usual methods of treatment have failed, the question of arthrotomy and removal of the loose body must be considered; and if there is no valid contra-indication, the removal of the loose body or torn tissue by an open operation is the surest and quickest means of effecting a lasting and complete cure.

II. MUSCLE SPRAINS.

Muscles and tendons are liable to injury in many ways; thus, they may be strained or sprained from undue stretching, become herniated through splits in their enveloping fasciæ, displaced or dislocated from the groove in which they normally run, partially ruptured, or even torn across.

The tendons around a sprained joint usually suffer, though to a less extent than the ligaments which bind the bones together. When a muscle is over-stretched or partially torn it is said to be strained or sprained. Athletes suffer more from muscle sprains than labourers. The injury is usually the result of sudden violence when a muscle or group of muscles is taken unawares and brought into action. There are many examples, e.g., 'rider's sprain', affecting the adductors of the thigh; 'jumper's sprain', the hamstrings or calf muscles; 'tennis elbow', the pronator radii teres; 'driver's or angler's elbow', the common origin of the supinator extensors of the forearm; 'labourer's back,' with which the sacro-lumbalis is concerned; and 'bowler's side', affecting the oblique muscles of the abdomen. The symptoms are pain, tenderness on pressure, and inability to carry out the particular movement or movements concerned in the injury. As a rule recovery is complete, though it may be long delayed.

The treatment consists in discontinuing the movements which produce pain or spasm when the muscle is examined, and in *strapping* the painful part firmly and completely so as to allow the individual to use some of the muscles freely without putting strain upon the injured ones (*Fig.* 66). Massage and electric vibration may be employed in addition, and applied over the strapping.

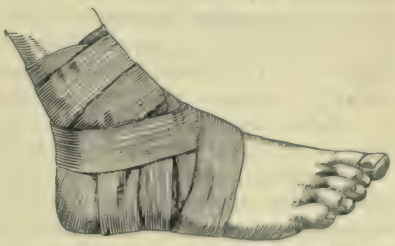


Fig. 66.—Strapping for a sprained ankle. It is applied to the skin direct, not over cotton-wool.

Strain is meant, in muscular as in articular sprains, to indicate the less severe disability.

Hernia in Muscles is comparatively rare. The protrusion is oftener through a longitudinal slit than through a transverse tear, and as a rule requires little more in the way of treatment than strapping and massage. When the protrusion is large and inconvenient, open operative methods may be required for complete anatomical restitution.

Dislocation and Displacement of Tendons is also comparatively rare. The commonest examples are displacement of the peroneus longus and tibialis posticus tendons, with lodgement on to the external and internal malleoli respectively; and of the long head of the biceps flexor cubitis inwards or outwards from the bicipital groove of the humerus. The small tendons at the back of the neck are occasionally displaced over the posterior tubercles of the transverse processes of the vertebræ. These are all the result of violent twists during certain specialized movements.

The treatment of these conditions, after the reduction of any displacement, is usually by rest and strapping. When relapses occur, it may be necessary to operate to refix the tendons into their grooves.

Rupture of Muscles and Tendons is fairly common, and usually occurs near to their points of attachment to bone or where the muscle fibres join the tendinous; it may result from outside injuries such as blows or crushes, but it is more generally occasioned by sudden, indirect, and involuntary forms of violence. When a muscle ruptures, its fibres contract and retract so as to leave a gap. The amount of separation depends mainly upon the length of the muscle. The tears are usually only partial. As the result of tearing there may be much ecchymosis and swelling; the proximal fibres are drawn upwards, and a gap may be seen and felt. The symptoms are not severe, and the diagnosis is often evident on inspection.

Treatment is directed towards supporting the tear with strapping, unless the swelling is great, when elastic pressure should be used at first. As the tears are usually only partial, this line of treatment is generally suitable and efficient. In severe and complete tears in important muscles, *immediate suture* may be necessary, and gives better results than secondary suture. When the muscle is small and unimportant, position and strapping usually suffice, if supplemented later by massage and exercise.

SEQUELÆ OF SPRAINS.

Many permanent disabilities result from faulty or careless management of sprains, whilst others cannot in any way be laid to the fault of the surgeon. They therefore fall into two groups: (1) *The avoidable*; (2) *The unavoidable.*

1. **Avoidable Sequelæ.**—Among these are stiff and painful joints, recurring and relapsing synovitis, atrophy and wasting in muscles, crippled and deformed joints, improperly-united muscles and tendons, and ankylosis. Nearly all these disabilities arise from undue and over-prolonged fixation and a disregard for the promotion of early movements. Sprains are often treated as if they were fractures. Joints are designed for movement and not rigidity, and should be treated accordingly.

Ankylosis is rare except in those cases which readily yield to 'breaking down' under an anæsthetic. Such a condition usually follows upon a sprain-fracture, the true nature of which was not recognized at the time, and which was probably treated by extensive and ill-advised passive movements. The enforced and oft-repeated movements give rise to increased formation of callus in the neighbourhood of the articular surfaces; this not only tends to mechanical locking, but affords opportunity and place for new and strong adhesions to form.

2. **Unavoidable Sequelæ.**—These permanent and remote consequences, though beyond the control of the surgeon as regards prevention, are of interest in so far as they influence prognosis. They consist of local paresis and paralysis, ossifying myositis (muscles), osteo-arthritis (articular), and loose bodies in joints.

Paresis and paralysis may be treated by massage and electrical treatment, which may be of service if continued for a long time.

Ossifying myositis is best kept as quiet as possible. Friction and violent massage is harmful and should be carefully avoided. The tendency is for the bony deposit *to be reabsorbed* in time if the limb is kept quiet, so that violence and continued exercises must be prohibited. If the bone plaque is painful or inconveniently situated, total excision of the muscle may be required.

Osteo-arthritis, the true pathology and nature of which is as yet improperly understood, is of different types. The treatment in the case of elderly people must be adapted to prevention in the first instance, especially by removing every cause of chronic irritation, and later on, to meeting symptoms as they arise. Drugs, baths, vaccines, thermal applications, electricity, various exercises, have all been tried, and with varying success. The outlook is not a bright one when once the condition is fairly established; and it is only in the early cases that cure is to be expected.

Loose bodies, of whatever nature, whether solitary or multiple, whether occurring as the result of disease or trauma, should be removed by operation as soon as they give rise to symptoms of pain and stiffness, and as soon as the diagnosis is clear. No other means of treatment is curative. The danger of osteo-arthritis supervening from their chronic irritation should always be borne in mind.

SPECIAL FORMS OF TREATMENT.

Hydrotherapy.—Of all the special forms of treatment, that which affords the best means, in the writer's experience, of dealing with those troublesome and persistent late cases of sprain with pain, stiffness, and disability arising from constitutional complications or mismanagement, or both, is hydrotherapy. This allows of easy, gentle, intermitting or long-continued voluntary exercises in a temperature suitable to the relaxation of the ligaments and other fibrous tissues of the joints and muscles and the tendons which move and support them. Such treatment may be readily obtained at the *brine swimming-bath* at Droitwich. It will be noted that the same therapeutic principle is utilized in the treatment of chronic, late, and obstinate cases as in the management of the early and acute. In the brine baths the buoyancy of water is such that there is a constant tendency for the feet and legs of the swimmer to rise, whilst the head tends to go under. To prevent this the patient has to be constantly 'on the move', so that all parts of the body and all the muscles are at the same time gently exercised. The temperature of the water, usually about 90°, is eminently suited to muscular relaxation, whilst the gentle movements continuously made in the water afford fitting exercises, and stretch the muscles and hardened

ligaments, so that pain and stiffness disappear together, and atrophy and weakness are superseded by renewed growth and strength in the muscles.

The *whirlpool bath* is another example of hydromechanotherapy which, after an extensive practice in France, became fashionable for a time in this country during the War. This appears to act on the same principle as the brine swimming-bath, though differing in detail; gentle exercises are performed after muscular relaxation has been induced by immersion in warm or hot water. Cold baths do not act as well, and few individuals are able to sustain the cold long enough to effect a cure; besides which cold renders the muscles more rather than less rigid, and whilst the temperature of 90° in the salt baths produces a truly agreeable sensation, the same cannot be said for cold applications. The efficacy of the brine baths supports the therapeutic principle taught by the present writer for many years, that active voluntary movements will prevent stiffness and atrophy and cure most joint affections if consistently and systematically practised. Douche spray, douche massage, and vibration baths are also useful, and may also be had at Droitwich. (*See also* HYDROTHERAPY.)

Bier's Hyperæmic Régime.—This is undoubtedly useful as a method of treating sprains. Its chief therapeutic value lies in promoting the absorption of effusions; and it is highly extolled by some when rapidity of absorption is an urgent necessity. *Active hyperæmia* is superior to prolonged *obstructive hyperæmia*, even when the latter is preceded or followed by massage. Relapses are not uncommon after hot-air treatment, and the result on the whole cannot be compared with those obtained by elastic pressure, either as to rapidity, efficiency, or simplicity.

Obstructive hyperæmia, by removing the effusion, has been of help in a few cases of chronic articular synovitis. (*See* BIER'S HYPERÆMIC TREATMENT.)

Mechanotherapy.—The chief application of this form of treatment is for overcoming stiffness and atrophy in the latest stages of injury; it is of but little service in the earlier management. Mechanical exercises encourage patients to persevere in movements when they often would not do so otherwise, and they are helpful in cases that have been mismanaged; but no mechanical exercises are as efficient in overcoming muscular atrophy or promoting regeneration of muscle as are active voluntary movements.

Injections of Fibrolysin.—These injections have not come up to expectations. The softening effects on fibrous tissues is not as great as was at one time thought, and there are some decided disadvantages, such as changes in the blood; even fatal cases of purpura have been recorded as following its administration.

Ionization.—One of the most important results of electrolytic treatment is the resolving influence on cicatricial formations when a kathodal stream of solution of sodium chloride is employed. Joints completely ankylosed (fibrous) have been said to regain their function rapidly without forced movements or pain. The electrolytic method is useful also for the administration of the specific remedies (lithia, soda, salicylates, iodine, chlorine) in old sprains complicated with gout, rheumatism, or other constitutional affections. In the opinion of many it is the electrolytic action of the cells themselves that does most of the good, rather than the introduction of any of these specific drugs; or, in other words, it is the effect of the current on the tissues rather than the influence of the drug. The more superficially placed the joint, the more amenable it is to the method. The use of ionization as a therapeutic measure is daily becoming greater; doubtless it will be found helpful in some of the most obstinate cases, and even in those which were constituted surgical failures. *R. H. Anglin Whitelocke.*

SPRUE (Psilosis).—Absolute rest of the body and mind, and as complete rest of the intestinal tract as is possible, are the essentials in the treatment of this disease. The strength must also be maintained.

The most important part of the treatment is dietetic.

1. *Milk Treatment.*—The milk should be sipped frequently, but in small quantities at a time. It is best to begin with 5 oz. every two hours, and as the motions become less frequent, to increase the amount gradually and also lengthen the intervals. Under this treatment, though the amount of milk taken is large, there should be constant hunger. Later, the motions, though not normal, become formed. Constipation must be carefully guarded against. If there be any tendency to it, small doses of castor oil (1 drachm)

should be given. This treatment in young adults is highly successful, but the cravin for food is so great that many persons will not keep strictly to the diet, and therefo it is best carried out in a hospital, or where the patient is under control. In old perso the digestion is so feeble that, though the severity of the symptoms may abate, th debility and emaciation increase. Such cases are very difficult to deal with, as an increase in the diet brings on a recurrence of the disease. In such cases a combinatio of this diet with fruit or meat juice may be advantageous.

During convalescence the diet may be varied gradually. Stewed apples, fish, an (later) small amounts of farinaceous food can be allowed. The return to an ordinary di must be made very gradually, and, if any symptoms of relapse occur, the milk diet must b resumed. The patient must never be allowed to become constipated ; olive oil or cast oil are the best laxatives to employ. Drastic purgatives must be avoided. Stimulan are contra-indicated.

2. Another dietetic method, which may be employed when a pure milk diet is n tolerated, is the '*fruit cure*'. Large quantities of fresh or preserved fruit without suga such as bananas, strawberries, pears, apples, grapes, are taken.

3. *Meat Diet* has many advocates. The meat must be either raw or very light cooked. In a very severe case, feeding every hour with raw beef juice may be necessar Ordinarily 5 oz. of pounded meat should be given three times in the day, and home-ma beef jelly or calf-foot jelly every two hours between feeds. The jelly should be taken night also if the patient is awake, and the first thing in the morning. In a few days t diet may be increased and poached eggs given. Strawberries go well with this di Three or four pounds of fresh strawberries can be taken between meals. Soup made fro liver seems of benefit in some cases.

Drugs are of little value. A preliminary aperient should be given, and subsequent the patient must not be allowed to become constipated. Opium is injurious, and so alcohol. Any of the digestive ferments—pepsin, pancreatin, papain—may be used, b the result of their administration is not marked.

The use of yellow santonin, or chromo-santonin, 3 to 5 gr. in a teaspoonful of cast oil, for six successive days, has been strongly advocated, and seems to be of value in so cases.

Intestinal antiseptics, such as β-naphthol, are used by some observers. For t anæmia, injections of arsenate of iron (Squire's liquor ferri arsenatis), as recommend for tropical anæmia, may be employed.

Vaccines with streptococci isolated from the saliva and with cultures of yeasts isolat from the intestinal canal have recently been advocated, and have apparently given go results, though it is doubtful whether they have had a sufficiently searching trial.

The mouth affection may cause trouble, even when the patient is improving oth wise. Weak carbolic mouth-washes (1 per cent) or weak boracic lotion (5 per cent) a useful. When the condition of the mouth is very painful, the ulcers may be brushed w cocaine (5 per cent) before food is taken. Chlorate of potash 10 gr. to the ounce as a mou wash, and subsequently swallowed, relieves the dryness and often causes a rapid impro ment in the condition of the mouth. Oral sepsis from carious teeth or from pyorrh alveolaris, and irritation from irregularly placed or broken teeth, must be remedied.

C. W. Dani

SQUINT.

Paralytic.—Our efforts must be directed towards treating the cause of the paraly potassium iodide, salvarsan, mercury, salicylates, or colchicum being given according the nature of the disease.

Locally, the constant current may be useful in maintaining the nutrition of the mus Prisms occasionally assist the patient, but these only relieve the diplopia in one posit of the eyes. The discomfort of diplopia is, as a rule, overcome only by wearing a gre glass or shade over the affected eye. In some old-standing cases an operation may attempted.

Concomitant.—

A. *Convergent Squint.*—Our object must be not only to correct the deformity, b to set up or restore binocular vision whenever this is possible. The cause of concomit

squint being a faulty fusion of the retinal impressions received from the two eyes, combined with imperfect muscular balance, the principles we have to keep clearly before us are: (*a*) to remove any strain on the accommodation which is upsetting the muscular balance, by ordering glasses to correct any refractive error; (*b*) to train the acuity of the squinting eye; (*c*) to train the fusion sense. If the acuity of vision in both eyes is good, and the fusion sense established, then, as soon as the eyes are straight, binocular vision will be gained.

When one eye is very amblyopic, and remains so in spite of our attempts at training it, we can never hope to get binocular vision; again, in certain cases the fusion sense can never be acquired, as in most cases of true alternating squint, and here also binocular vision is unattainable. In these two classes all we can hope for is to cure the deformity. In most cases of squint, however, the attempt should be made to attain binocular vision. *We cannot begin too early*; owing to neglect we often have to start too late. The best time for training the acuity of the amblyopic eye and the fusion sense is in the first seven years of life, and we should begin as soon as the squint appears.

The order of our treatment should be:—(1) *Test refraction* under atropine, and order correcting glasses for constant wear; (2) *Train the squinting eye* by blocking the good eye with a pad or a black goggle, or paralyzing the accommodation of this eye by atropine; (3) *Train the fusion sense* with the amblyoscope, stereoscope, or by 'bar reading'; (4) *Measure angle* of squint at regular intervals; (5) *Operation*, when this is necessary.

1. The full astigmatic correction, and not less than 0·5 D below the full hypermetropic correction under atropine, should be worn constantly, except at bedtime. (A baby even under one year may safely wear glasses in special frames. These have short sides which end in loops, to which are attached tapes to tie behind the head. When a baby is too refractory for a retinoscopy to be done, the good eye should be blocked with a pad: *vide infra*.)

2. If the squinting eye is very amblyopic, the good eye should be blocked all day for at least two months, either with a pad of Gamgee, placed between the eye and the glass, which is fixed with strapping or a bandage; or by a special pair of glasses which have a clear lens over the squinting eye and a black opaque goggle over the good one. If marked improvement has not taken place in two months, training of this eye can be abandoned as hopeless. If the eye is not very amblyopic, a useful method of training is to put a little atropine ointment (4 gr. to the ounce) once a day into *the good eye only*, to paralyze its accommodation. Then, when wearing the glasses, the good eye can see in the distance but not close to, while the squinting eye, having its accommodation intact, can see close to, and will therefore be used and trained.

3. Training of fusion sense. (*a*) While the squint is present, this can only be done by means of the 'amblyoscope', or, where the squint is slight, by a stereoscope provided with a pair of strong rotating prisms, and under the immediate supervision of the doctor himself (*see* Worth on 'Squint'). (*b*) When the eyes are straight, fusion is trained by means of the stereoscope and Krolls pictures, and by 'bar reading'.

4. If glasses bring the eyes straight, training both of the acuity and fusion sense should be continued till perfect binocular vision is obtained. If the squint persists, the angle should be measured from time to time to see if it is diminishing or remaining stationary.

5. No operation should be performed till glasses have been worn for at least a year, and not till at least six months have elapsed since any improvement in the squint has taken place.

For squints of less than 25°, either tenotomy of the internal rectus, or simple advancement of the external rectus, is advisable. For more than 25° we combine the two operations. *After operation* the training must still be maintained, to acquire, if possible, binocular vision. All operations for squints are much more satisfactory and certain in the results if they are done under cocaine without a general anæsthetic.

B. *Divergent Squint.*—The refraction should be tested and glasses worn regularly. If the divergence disappears, we try to train the eyes to work together as in convergent squint. Unfortunately cure with glasses is not very common, and an operation then has to be performed; and even if the operation bring the eyes straight, binocular vision is seldom obtained. Tenotomy of the external rectus affords us only about 5°, so that

tenotomy of both external recti is only suitable for divergence of 10° or less. For higher degrees, advancement of the internal rectus, combined with external tenotomy, is necessary. It is not advisable to operate for divergence of highly myopic eyes.

W. Tindall Lister.

STAMMERING.

Preliminary Considerations.—In order that the rationale of the treatment of stammering shall be clear, it is necessary to summarize briefly the etiological and pathological considerations upon which it is based. In the circumstances we shall state the facts dogmatically, and refer the reader elsewhere for the evidence in support of them.

Stammering is due to spasm of the respiratory muscles in the act of speech. The over-action of the respiratory nervous centres producing the spasm rapidly spreads into the centres controlling the laryngeal and oral mechanisms, and leads to spasm of the muscles of the throat, mouth, and face. In bad cases the disturbance may spread even so widely as to cause spasmodic movements of the arms and other parts of the body. Thus the spasmodic action of the articulatory muscles, although, as a rule, the most obvious phenomenon of stammering, is, in the great majority of cases, really a secondary event, due to the spread of a disturbance beginning in the respiratory mechanism. This fact must never be lost sight of in treatment; and where the patient is old enough to apprehend it, it should be carefully explained to him; though, when the articulatory difficulty is extreme, it will not be easy to convince him that the primary seat of his trouble is elsewhere.

The causes which lead to stammering are twofold: (1) *Predisposing;* and (2) *Exciting*. Of the former a neurotic inheritance is one of the most important, and a family history of stammering is not infrequent.

Under the latter head we have anything tending to interfere with and embarrass respiration early in life, as, for example, adenoids. Such an interference leads to faulty modes of breathing and a low respiratory volume or 'vital capacity', which react unfavourably on the controlling centres. The result is an irritability and irregularity in the action of these centres, which are especially manifest during speech, when the demands made on the respiratory mechanism are highly complex and, unless met in the best way, somewhat exhausting.

It will be evident, then, that treatment must be directed to (1) The removal, as far as possible, of respiratory defects, and such of the causes which have led to stammering as may still be operative; (2) The education of the amended mechanism until spasm no longer tends to occur, or, if it does, can be prevented by voluntary control. In other words, treatment must be (1) *Prophylactic;* (2) *Educative*. These two general indications are equally important, although the first is liable to be neglected—and is, indeed, always neglected by the numerous quacks who hold so large a share of the public confidence. It is unreasonable to look for any permanent benefit from educative treatment so long as the causes which have led to the derangement are in active operation. And further, while educative treatment is always difficult, and demands both patience and experience, the necessary prophylactic measures are readily taken, and may alone lead to considerable improvement in speaking.

1. **Prophylactic Treatment.**—The influence of a neurotic inheritance so often lying at the bottom of the trouble cannot, of course, be done away with, but it should be vigorously combated by measures directed to the control of the general health of the patient, and by dealing with any existing causes of nervous irritation or depression. Chronic dyspepsia, for example, is not infrequently a potent cause of nervous irritability and highly detrimental to a stammerer. A sufficiency of fresh air and exercise must be secured in all cases. Regular work is very desirable. Too little work is probably as bad for stammerers as overwork, as discouraging the development of powers of mental control and concentration, which imply the rigid limitation of nervous discharge to the part of the brain required for any particular action, the very thing the stammerer so egregiously fails in during speech. Moreover, the habits of a daily routine will be very valuable to the patient, in that he will almost certainly have to undertake daily exercises for some years if he is to overcome completely his disability. In a word, it is important to do what is possible to increase the nervous tone and self-control of the patient, and such details of hygiene as the open window at night will well repay the attention given to them

Having inquired into the general health and mode of life of the patient, and devised the appropriate hygienic measures, the chest and respiratory passages should receive special attention. There should be a perfectly free respiratory passage through the nose. This may be roughly tested by asking the patient to blow out a match held about a foot from each nostril in turn, the mouth being shut and the other nostril closed by the finger. Adenoid vegetations in the nasopharynx are very common in stammerers, and although since atrophied, were frequently the original exciting cause of the condition. Thus in our analysis of twenty-seven consecutive cases in Mrs. Behnke's clinic, over 50 per cent presented a clear history of some nasal obstruction. Adenoid growths, with or without enlarged tonsils, were the most frequent cause. More rarely a deflected septum, a spur, or chronic hypertrophic catarrh, may be the cause of obstruction. In one case, lately recorded by Mrs. Behnke, a button had been pressed into the back part of the nose by the patient when a child. It had remained there a year or more, during which time the disturbance of speech began. Whenever there is obstruction there can be no doubt that the first thing to be done is to remove it, and then to instruct the patient to keep his mouth closed, and to breathe through his nose. Without removal, experience has shown that exercises of whatever sort are only waste of time.

The lungs should be carefully overhauled. A slight chronic bronchitis, such as is ignored by most people in the winter time, is of great disadvantage to the stammerer. Even a laryngeal catarrh, leading him to spare his voice, will encourage stammering.

Nearly every stammerer has a low 'vital capacity' (complemental + tidal + supplemental air): thus, when correlated with stature in a series of 46 male stammerers, it was found to average 35 per cent below normal. This would seem to imply that the amount of 'tidal air' which the stammerer has conveniently at his disposal is also small, and perhaps a direct result of this is the not uncommon habit of speaking during *inspiration*. The existence of a low capacity is to be sought for in the type of respiration. It is thoracic (often upper thoracic) rather than abdominal; that is, costal rather than diaphragmatic. Sir Arthur Keith has shown that it is by the descent of the diaphragm that the lungs are most effectively aerated, and that smaller movements of this wall are required for the respiration of a given quantity of air than of any other wall of the thoracic cavity. It is important for a stammerer to have as much wind as he requires for his sentences with the least possible effort. Hence he must be taught to make full use of his diaphragm in breathing; and in order to secure the maximum degree of efficiency, to this should be added the great thoracic enlargement which accompanies a free elevation of the lower costal wall. As the diaphragm contracts, it forces the abdominal contents downwards, and the muscular abdominal wall relaxes to make room: as the diaphragm relaxes, the contraction of the abdominal muscles restores the parts to their former position; for it must be remembered that expiration is as much a complete muscular act as inspiration, and not merely a passive relaxation or elastic recoil. Thus, in the abdominal type of breathing, the range of movement of the belly wall during breathing is, to an extent, a measure of the descent of the diaphragm. When, on the other hand, there is much expansion of the thorax owing to the excursion of the lower ribs, the upper end of the abdominal cavity becomes considerably widened, and the contraction of the diaphragm now causes less protusion of the anterior abdominal wall. Experiments with a spirometer show that it is this combined lower costal and diaphragmatic expansion which yields the greatest capacity. For purposes of training it is best at first to direct the patient's attention to the diaphragmatic and the costal movements separately. He should be given the two following exercises, which may be performed either standing or lying flat on the back.

1. *For Diaphragmatic Breathing.*—Placing one hand flat on the epigastrium, take a series of slow deep breaths, blowing out the belly as much as possible at each inspiration, and allowing it to sink in at expiration. In this, as in all the exercises described below, the breath should be taken in through the nose and let out through the mouth, thus imitating the proper manner of breathing in speech.

2. *For Costal Breathing.*—Place each hand so that the backs of the fingers rest on the seventh or eighth rib in about the nipple line, as shown in *Fig.* 67*a*, and take a series of deep breaths, magnifying the costal movement as much as possible. In each exercise the attention must be riveted on the motion of the part beneath the hand.

Having practised these exercises separately, the patient should next endeavour to combine the two, and, with one hand on the belly and one on the chest, to magnify the excursions of his diaphragm and ribs simultaneously.

When the patient has made some progress in diaphragmatic breathing he should be given a series of exercises which, as experience has shown, will both develop the muscles

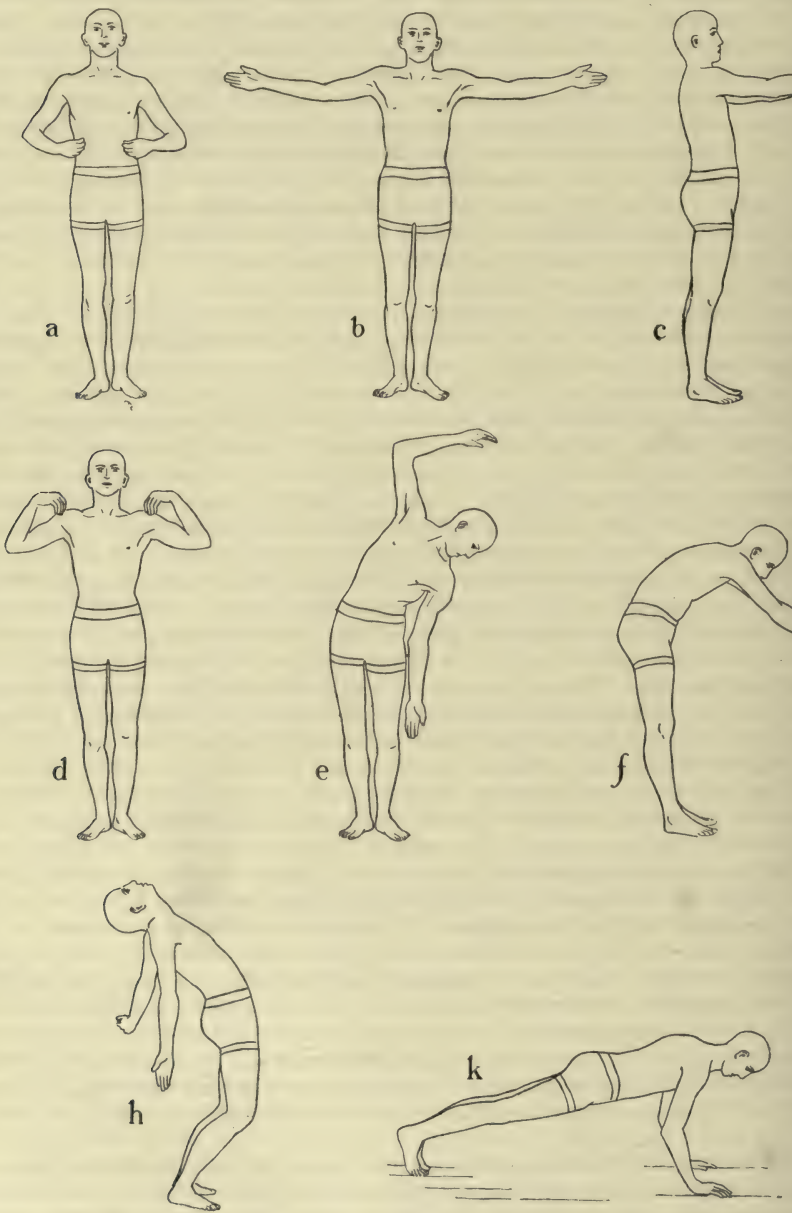


FIG. 67.

of his chest and increase his vital capacity. Such a series has been devised by Mrs. Emil Behnke, and, fully described in her book on 'The Speaking Voice'; but they form such an essential part of the treatment of stammering that it will be well to describe here a few in detail. These exercises may be practised in ordinary attire, provided there is nothing tight (such as corsets) round the waist or chest which can in any way impede the

respiratory movements. Light dumb-bells may be used with advantage, but are not essential. While performing each exercise the patient must see that the accompanying respirations are full and deep, with ample diaphragmatic and thoracic play.

1. Stand upright and place the arms at the side in the military position of attention. Now raise both arms slowly into position *b*, *Fig.* 67, and from this carry them right up over the head; during the movement take (through the nose) a long inspiration. Now reverse the movement and lower the arms through position *b* back to the side again; at the same time slowly let out the breath (through the mouth).

2. Raise the arms from the side slowly to position *c*; at the same time take a deep breath. Swing the arms sharply back in a horizontal plane into position *b*, while forcibly expelling the breath; then drop them to the side again.

3. Begin with the arms in position *d*. During inspiration slowly extend them horizontally, setting the shoulders well back and 'opening' the chest. During expiration, slowly return to the flexed position. The second (extended) position in this exercise is similar to *b*, except that the palms of the hands are turned up.

4. Stand upright with the arms to the side, and slowly swing over into the position shown in *e*. During this movement take a full breath. Now slowly swing back again and let out the breath. Repeat the movement on the opposite side.

5. Standing in position *f*, swing the arms right over the head back into position *h* while drawing a deep breath *and* letting it out again. Swing back again into position *f*, and again take a breath and let it out.

6. Lie at full length prone on the floor. Flex the arms and, keeping them close to the side, place the hands on the floor, palms down. Press the body up to arm's length into position *k*, keeping the trunk rigid the while, and draw a deep breath. Lower again to the floor while breathing out. Those patients for whom the exercise is too arduous in this form may practise it leaning forward against a wall or the back of a chair.

Each of the above movements should be repeated six to twelve times; and at first the exercises may be practised with advantage three or even four times a day. When the patient has reached a stable condition with little or no stammer, the performance of the exercises for a few minutes night and morning may be sufficient.

Before considering the education of the vocal mechanism in the act of speech, we would strongly urge the advisability of applying to all cases, at as early an age as possible, some such prophylactic treatment as we have indicated. And we would most emphatically protest against the common practice of withholding all treatment from stammering children until they are old enough to appreciate and profit by educative treatment. Stammering usually begins at about the fourth or fifth year, and it is probable that the removal at this age of large tonsils or adenoid growths, and the exhibition of simple breathing exercises, would in many cases be sufficient to lead to the disappearance of the habit before the channels of vicious nervous discharge had become firmly established.

2. **Educative Treatment.**—The treatment that we have so far described tends only indirectly to lessen stammering, and we have still to consider measures for directly preventing the respiratory spasm which, spreading from the vocal to the articulatory mechanisms, is the immediate cause of the disturbance in speech. The rational methods which have been devised to attain this end aim at establishing, by suitable exercises, a voluntary control by the higher centres of the whole or part of the mechanism of speech. Such exercises fall into two distinct classes.

1*st Class.*—Exercises in which the attention of the patient is directed towards the result produced; the method of producing it being thus indirectly controlled.

2*nd Class.*—Exercises in which the attention is directed to the actual movements of some part of the mechanism of speech, so as to predetermine the result produced.

For example, if a passage be read aloud slowly and with exaggerated clearness and precision of enunciation, it would form an exercise of the first class in articulation. If, on the other hand, the reader has acquired a knowledge of the exact position that the tongue and lips should occupy for the pronunciation of each letter, and in reading the passage he were consciously to put his articulatory apparatus through the requisite movements, then the exercise would be one of the second class. The value of exercises of this latter class is very great, provided always *they are of that part of the mechanism of speech which is the seat of the primary disturbance.* Exercises of the first class may at the

outset be very difficult for a stammerer, the indirect subconscious control of the seat of the disturbance being insufficient to prevent spasm. From exercises of the second class, however, he soon acquires voluntary control of the disturbance at its point of origin, and can in this way deliberately prevent it.

In the great majority of cases stammering begins, as we have stated, with a delay in the action of the respiratory mechanism, and hence the exercises we should naturally seek are such as will control especially the respiratory function. The patient must be told from the outset to ignore his articulatory difficulties, and to attend only to his respiratory movements and to the character of his vocalization with the assurance that his articulation will then look after itself.

Now, there is a quality of speech which is solely determined by a proper and orderly management of the breath, namely rhythm. It has long been observed that stammerers read verse with greater facility than prose, and advantage has been taken of this fact in their treatment. Colombat, Merkel, and, in recent years, Mrs. Behnke, have taught the advantage of emphasizing the natural rhythm of all speech. A rhythmical mode of speech is neither offensive nor *bizarre*, indeed it is characteristic of the best speakers. "The more natural and flowing the diction," says Mrs. Behnke, "the more evenly and regularly falls that pulsation to which the name of 'rhythm' is now usually applied." The observance of rhythm implies the raising of the intensity of the sound on the syllables on which the accent falls, and the maintenance of a certain time relation between those syllables. This rise in intensity is solely dependent on a more powerful blast of air at the moment, that is, on an instant acceleration of the expiratory act. In the adoption of a rhythmical in place of an arrhythmical mode of speech, the demands on the respiratory muscular system are much simplified, for the variations in its rate of movement are reduced from an irregular to a regular series, i.e., to a series which the stammerer subconsciously forecasts independently of the words, and which is, therefore, less readily disturbed. Thus, whenever the patient accentuates and prolongs the rhythmical syllables in his speech, he is indirectly exercising the respiratory act in a series of augmentation and retardations—an exercise of the first class. In the slighter cases this form of practice may be sufficient to give the necessary respiratory control. And in order that this rhythmical control may be thoroughly acquired, the patient must read, first verse and then prose, with great exaggeration of the rhythm, the rhythmical syllables being both *accentuated* and *prolonged*. As the actual marking of the rhythm in prose occasionally presents some difficulty to those whose attention has not been previously drawn to it, we have accented, for example, the following passage from Stevenson :—

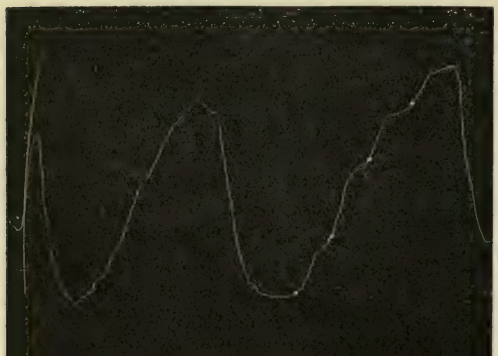


Fig. 68.—Respiratory tracings showing the effect of alterations in the intensity of the voice uninterrupted by consonants and the pitch remaining constant. The tracing reads from left to right. The expiratory part (up-stroke) of the first curve represents the vowel sound '*ah*' sung with (fairly) constant intensity, and at a constant pitch. The second curve shows the effect of raising the intensity of the tone on the beats of a metronome, and letting it die away between the beats. The small dots indicate approximately the points at which the intensity was raised. The finer undulations on both curves are due to the heart-beat. (It is to be noted that the pressure exerted by the respiratory muscles varies as the square of the velocity of the out-driven current of air, so long as the laryngeal aperture is constant. Hence the variations in pressure which produce variations in the intensity of the voice are proportional to the square of the amplitude of the accompanying waves in the pneumographic tracing. Thus very slight undulations in the tracing may be evidence of quite appreciable variations in the muscular activity.)

"He was lóved and respécted by sóme of the bést and wísest mén in England. He was Président of the Róyal Socíety ; and whén he cáme to díe, people sáid of his cónduct in that sólemn hóur—thínking it néedless to say móre—that it was ánswerable to the gréatness of his life. Thús he walked in dígnity, guárds of sóldiers sómetimes atténding him in his wálks, súbalterns bówing before his périwig ; and whén he úttered his thoúghts they were súitable to his státe and sérvices."

Now, with many stammerers this mode of control may be insufficient and may fail hem at critical moments. The very power to accentuate the rhythm seems on occasion o vanish. Hence it is well in any but very slight cases to give also exercises of the econd class, in order that a more direct control may be obtained over the source of the isturbance. Let the patient stand with his hands resting against the lower ribs position *a*, *Fig.* 67) and utter any prolonged vowel sound—*ah*, for example—maintaining n even intensity of tone throughout. Bid him notice and fix his attention upon the ven and continuous collapse of his thorax beneath his hands. Next let him say a long *h* with rhythmical accentuations, about one a second, allowing his voice to die away etween the accentuations, but not to fail altogether. He will then observe that the otion of the thoracic wall beneath his hands undergoes corresponding rhythmical accelera- ons and retardations. The difference between the former and the latter expiratory hase is well shown on the pneumographic tracing in *Fig.* 68. The first up-stroke describes ne motion of the thoracic wall during an even *ah*, the second (undulatory) up-stoke khibits the same during a rhythmically accentuated *ah*. The stammerer should practise is until he becomes acutely conscious of the variations in the rate of collapse of his orax and abdomen which correspond to variations in intensity of the sound, and until e can alter the intensity by deliberately altering the rate of motion of his chest wall and iaphragm. He should next take some piece of simple poetry with a well-marked rhythm nd learn it by heart, until he can say it almost ubconsciously. He should then practise reciting , again with an exaggerated rhythm, but now oluntarily directing the respiratory movements hich predetermine the accentuations. If he can o this he will be giving his respiratory mechanism perfect exercise of the second class in speech. he undulatory character of the expirations which e must recognize and consciously accentuate re illustrated in the pneumographic tracing in ig. 69, recording the respiratory movements as line of Longfellow's ' Hiawatha ' was being cited with a greatly accentuated rhythm. This oem is particularly well adapted to early prac- ce, for (1) The lines are short ; (2) The rhythm obvious ; (3) The first syllable in every line is ccentuated. The patient will do well, however, ot to confine himself to verse, but to extend is form of practice to the reading of prose ; ways reading with a full voice, and a highly, ven grotesquely, exaggerated rhythm.



Fig. 69.—Pneumographic tracing of the line *With the ódours ón the fórest*, spoken slowly and with the rhythmical syllables accentuated and slightly prolonged. Reading from left to right, the first upstroke shows a series of four undulations which correspond to the four accented syllables of the line. These variations in the rate of expiration may be readily appreciated by a hand laid on the epigastrium.

If, then, the stammerer will practise these rms of exercise, he will, in the event, become ossessed of two means of control in ordinary peech with which to check the onset of spasm—rst, by attending to the rhythm of his sentences, nd, secondly, by consciously directing his respiratory movements. The first should ecome his regular habit of speech. The second is not practicable for continuous use, ut should be relied upon in case of emergency and a sudden inclination to stammer.

The above represents a general scheme of treatment for a typical case. Modifica- ons, such as experience directs or necessity compels, must be made for individuals. And careful study of the idiosyncrasies may reveal special indications for the application educative methods. A brief reference to two or three further points will serve to ustrate this.

Many stammerers speak habitually in a thin voice, with little volume of sound. his may be partly due to an improper mode of delivery, but it is also due to the use of feeble air-blast in vocalizing. And if, during expiration, the tension of the expiratory uscles is only just greater than that of the inspiratory group—as will be the case if the r-blast be feeble—there would appear to be a greater tendency to spasm than if the

two groups of muscles were less nearly in balance. Hence, it is well to encourage al stammerers to speak in a full, resonant voice. The increase in loudness may, however necessitate the voice being pitched in a lower key, lest it should become unpleasant.

Again, anything which acts as a mechanical check to the breath-stream is a stimulus to spasm, and so we find the explosive consonants are the most common excitants o trouble. But, as we have shown with the pneumograph, the time that the breath is arrested varies considerably, according as the consonant is firmly articulated or only lightly touched on. It may, therefore, be advisable in certain cases to pay some attentio to lightness of articulation. But it must not be forgotten that the articulation is no the primary seat of the trouble, and any attention paid to it is liable to be at the expens of a more fundamental control.

Some patients stammer very severely on initial vowels, and it may be necessary t draw their attention to the fact that there are two distinct ways of initiating a vowe sound, one of which is easy to stammerers, and the other difficult. In the first (easy o smooth method) the vocal cords move up at once into exactly the position required fo the note, leaving a narrow slit between them. In the second (the difficult or explosiv method) the cords move up, meet, and press against each other, and then open again int the position required for the note. In this way a consonant formed in the larynx itsel precedes the vowel, and, similarly to other consonants, acts as a mechanical check to th breath. Now in ordinary speech it is usual to employ the second way in the case o vowels standing at the beginning of phrases ; but when the vowels present difficulty even after vigorous respiratory training, it may be well for the stammerer to practise th smooth method.

Prognosis.—Finally, it should be impressed upon patients that, in the main, thei improvement will be slow, but that its rate is chiefly dependent on their own persever ance and exertions. As their first progress is rapid, so surely will it be short-lived and their downfall early, should they kick away the ladder of practice by which the ascended. Again, having reached a certain point of improvement, they are liable t stand still for a time, blame the system, and seek another. It were as reasonable for cricketer to forswear the game because he finds himself 'stale' at the end of the season Let the stammerer, giving up all practice for a time, return to it later, when he will fin the effect of exercises surprisingly renewed. Let him also seek variety in practice. A few minutes' pure respiratory gymnastics night and morning will at times restore a los control, when hours of reading fail. With regard to the ultimate prognosis, a stammere cured is rarely the same as a man who has never stammered. Without incessant watch fulness on his part, his malady is certain to recur. These aspects of treatment are no unimportant, and it is well that the patient should be forewarned. *Robert Worthington*

STERILITY.—It is important, before undertaking the treatment of sterility, tha the practitioner should have a thorough knowledge of the physiology and mechanism o conception ; he will then better understand and appreciate the causes of sterility, suc knowledge will enable him to arrive at a proper diagnosis, and as a consequence he wi be in a better position to treat the lesion, should one exist, which is the factor in th prevention of conception.

It is outside the scope of this article to discuss anything but actual treatment. Ther are, however, certain points which must be mentioned before dealing with therapeutics.

Sterility due to the Male.—Before treating a woman for sterility—and it is nearl always the woman who seeks advice on this question—it is essential in every case that thorough investigation should be made of the husband's fertility ; it by no means follow that because a man is capable of having intercourse he is fertile, or that a man who i impotent is unfertile. The sole proof of a man's fertility can be obtained only by proper microscopical examination of the seminal fluid. It is essential that living sperm should be demonstrated, and in order to make sure of this, it is necessary that the flui should be examined as soon after emission as possible, certainly within the hour. If thi is done, there should be no difficulty in recognizing motile sperms.

Treatment.—The treatment of sterility in the male is very unsatisfactory.

Congenital malformations, such as hypospadias, undescended testicle, etc., may b remedied by surgical procedure. Acquired defects, such as nodules in the globus mino

the result of old-standing epididymitis, should be treated by short-circuiting the vas deferens and globus major (Martin's operation).

Dyspareunia is a condition that the male rarely suffers from, but such a condition can occur, and is usually due to a very tight prepuce ; the pain may be so severe as to prevent coitus. Circumcision is, of course, the proper treatment.

Too frequent intercourse is another and an important cause of sterility associated with the male ; the man may be perfectly fertile, but owing to excess the quality of the seminal fluid deteriorates ; this is particularly the case in the newly-married. The remedy is obvious.

Ignorance in both parties is sometimes met with ; it seems incredible that the man should be ignorant of his marital duties, but the writer has met with cases in which both husband and wife were absolutely ignorant. A little judicious talk and advice from the practitioner will soon put matters right.

Awkward connection is another not infrequent cause ; in many cases penetration has not taken place, and it is only after careful questioning that it will be discovered that the position assumed by the husband and wife makes it impossible for penetration to occur. Here again a simple explanation suffices.

Sexual incompatibility may exist ; that is to say, the couple may be sterile with each other, but either of them may be fertile with someone else. This is a condition which is not amenable to treatment.

Impotence is frequently a cause of sterility, but in many instances can be cured. It is by no means a condition always associated with age and decrepitude ; quite a large number of cases occur in young men. In the majority of these the impotence is produced by nervousness ; in such cases a temporary separation and tonic will put matters right. In others it may be necessary to treat the patient by suggestion, and the writer knows of many successfully treated by this means.

Impotence as a result of organic lesion cannot be treated, and impotence in the aged very rarely yields to treatment by drugs or suggestion. Artificial insemination is the only possibility in these cases.

Sterility due to the Female.—The treatment of sterility in the female resolves itself into the treatment of the associated condition.

Displacements should be rectified. Backward displacements are usually associated with acquired sterility, and in a condition of retroversion or retroflexion there is frequently descent of the uterus as well.

Of forward displacements, acute anteflexion is very often met with in women who are sterile ; it is associated with conical cervix and stenosed os ; dysmenorrhœa is a frequent symptom in these cases. It is absurd to suggest that the flexion offers mechanical obstruction to the passage of the sperm ; but there is no doubt that simple dilatation of the canal not only relieves the dysmenorrhœa, but pregnancy frequently follows the operation.

Congenital abnormalities, such as imperforate hymen, tumours, etc., can be treated surgically ; if, however, imperforate hymen is associated with hæmatocolpos and hæmatometra, pregnancy is not likely to result. Unruptured hymen should be dealt with surgically ; digital or mechanical stretching is not sufficient ; the hymen should be excised and the introitus vaginæ widened.

Vaginismus, which is one of the common causes of sterility, requires careful treatment. Any tender tags of the hymen (carunculæ myrtiformes) should be removed under anæsthesia, the introitus vaginæ should then be well dilated, and a glass vaginal dilator left *in situ* ; the patient should be instructed to introduce dilators of gradually increasing size every night, and should be advised to wear one all night. Finally, when the biggest dilator has been passed quite easily, the vaginal orifice should be well vaselined, and coitus attempted.

Pelvic inflammation should be treated with a course of hot douching and tamponage, either with glycerin or ichthyol and glycerin ; or the patient may be advised to have a cure at one of the many watering-places, e.g., Woodhall Spa, Ems, or Kreuznach.

The secretions of the vagina will not infrequently be found to be more acid than normal ; an alkaline douche, given some hours before coitus is attempted, is very frequently successful. In the gouty, the normal uterine and vaginal secretion may be

altered ; there is no doubt that pregnancy frequently follows a course of treatment which the patient may have undertaken with a view to alleviating the gouty symptoms.

Obese women rarely become pregnant, and in these cases the obesity should be treated before any local treatment, should this be necessary, is undertaken.

Artificial Insemination.—The cases in which this treatment may be resorted to are few. It is only in malformation such as hypospadias, disproportion of the sexual organs, and in impotency. In these cases it affords the only possibility of pregnancy. The results are very disappointing, but success is sometimes possible. *Jervois Aarons.*

STIFF NECK.—(*See* Rheumatism, Chronic.)

STOKES-ADAMS SYNDROME.—(*See* Bradycardia.)

STOMACH, CARCINOMA OF.—The radical treatment of cancer of the stomach is undoubtedly surgical, and there is reason to believe that if the diagnosis could be made sufficiently early, the results would be more encouraging than they are. Better results can only be looked for if practitioners will consider the propriety of surgical interference so soon as the presence of carcinoma is suspected. Even where removal of the disease has proved to be impossible, the performance of a gastro-enterostomy has often afforded great relief to symptoms, and has prolonged life. In cancer of the cardiac opening, a gastrostomy is obviously indicated when the difficulty of swallowing becomes great, and will, in these circumstances, if successful, prolong life. Apart from surgery, the means at our disposal are the use of liquid, nutritious, and non-irritating diet, which must in the main be composed of milk, eggs beaten up, soup, gruel, milk tea, coffee made with plenty of milk, or cocoa, and, if any alcohol is necessary, a little good champagne.

In order to relieve the pain, it may be necessary to give anæsthesin (5 to 10 gr. dissolved in olive oil or liquid paraffin), or opium in the form of hypodermic injections of morphia ($\frac{1}{6}$ to $\frac{1}{3}$ gr.), and if, as is often the case, there is some gastritis, we may use the same remedies as in chronic catarrh.

Orexine tannate (4 to 8 gr.) may be given in cachets ; magnesium peroxide, $\frac{1}{2}$ to 1 drachm, or bitters such as condurango, calumba, quassia, and gentian. *Robert Saundby (Revised by Robert Hutchison.*

STOMACH, CARCINOMA OF (Surgical Treatment).—Every case of *suspected* carcinoma of the stomach should be subjected to operation. If the condition can be certainly diagnosed, the most favourable time for removal has been allowed to pass. Cases of dyspepsia in adults which do not yield to rest in bed and diet after the mouth has been attended to and bad habits corrected, should be submitted to exploration after thorough investigation. Every case of organic gastric disease that fails to yield to medical treatment, or that relapses, should submit to surgical treatment ; only on these lines will cancer of the stomach be 'cured' and prevented. The greatest difficulty arises in the pre-operative diagnosis of cases of the appendix-dyspepsia type. Many of these have been sent to me as cases of gastric carcinoma.

Operation should be undertaken in all cases of suspected or proved carcinoma of the stomach unless obviously inoperable by reason of secondary growths, the surgeon being prepared to do a partial or a complete gastrectomy. The surgical treatment can be summed up shortly : the operation of choice is partial gastrectomy ; in certain cases total gastrectomy may be necessary. *Simple gastrojejunostomy should only be performed when the growth is producing pyloric obstruction.* If cardiac obstruction is present, gastrostomy may be done ; in certain cases jejunostomy may be advisable.

The results of operation by partial gastrectomy are extremely encouraging. The immediate death-rate should not be more than 10 per cent at the present time. The chance of freedom from recurrence for five years and over is at least a 25 per cent one. When recurrence takes place, the average duration of time is eighteen months from the date of operation, and the quality of life is much better than if gastrojejunostomy had been carried out.

Palliative Operations.—*Gastrojejunostomy* is of striking service in the relief of symptoms when the growth is causing pyloric obstruction, and in the rare cases of malignant hour-glass stomach. Its performance should be limited to these, for it affords little or

no relief when the growth is not causing mechanical obstruction. The immediate death-rate is much higher than when the operation is carried out for simple conditions. The average duration of life is about six months. The relief afforded is striking, and the operation is certainly one to be recommended. The patients are usually able to resume ordinary life.

Gastrostomy and Jejunostomy.—These operations do not stand on the same plane as gastrojejunostomy. As routine procedures in inoperable carcinoma of the stomach they are inadvisable. They belong to the class of operations that must be left to the choice of the patient, remembering that the quality of life is not good, and that the discomfort of artificial feeding is very great to some individuals. The immediate death-rate of gastrostomy is low. As a rule, life is not prolonged more than six months.

James Sherren.

STOMACH, DILATATION OF.

1. **Acute.**—(*See next article*).

2. **Organic or Secondary.**—For organic dilatation of the stomach due to pyloric obstruction the best treatment is operation. Pending this, or in cases where it is contra-indicated, the stomach should be washed out with plain warm water, preferably the last thing at night. Patients can usually be taught to do this for themselves, and after a time the lavage may be reduced in frequency to every other night and, later on, to every third night. If the lavage is properly performed, the use of antiseptics to prevent fermentation is unnecessary; but of these, salicylic acid (5 gr. in cachet every six hours) is the best. If there has been much vomiting and the patient has become 'dehydrated' in consequence, a pint of normal saline should be administered by the rectum night and morning. The diet must depend on the severity of the obstruction. In bad cases it must be fluid or semifluid so as to pass as easily and quickly as possible through the pylorus, and should be given in small quantities at a time; for less severe cases it may be on the same lines as in atonic dilatation (*see below*), but solids are best pounded or minced, and fermentable articles (such as sugars) should be forbidden.

3. **Atonic or Primary.**—Atonic dilatation of the stomach is frequently associated with Gastroptosis and with Neurasthenia (q.v.). In severe cases it may be necessary to put the patient through a Weir-Mitchell course, but taking care to proceed rather slowly with the process of feeding-up, and not to give too much milk for fear of over-distending the stomach.

In the slighter cases (atonic dyspepsia) the patient should be sent for a holiday, preferably to a mountain resort, but should avoid hard exercise, at first at least, and should lie down for half an hour after meals.

In all cases the diet should consist of small, dry meals (*see* Flatulence) taken at frequent intervals. If the dilatation be extreme it may be necessary for a time to adopt the Salisbury diet (2 to 10 oz. of partly-cooked minced beef given three times daily at three-hourly intervals, 5 to 10 oz. of hot water being sipped an hour before each meal).

Physical treatment in the form of massage and exercises and hydrotherapy (e.g., the Scotch douche) are helpful in all cases. Dr. Percy Mitchell has described a special form of massage which is often of great value in restoring the tone of the stomach. It consists in stimulating certain skin areas along the costal margin on both sides, which induces reflex contraction of the stomach and opening of the pylorus. The manipulation is carried out about five hours after a meal, and is performed at first daily for half an hour at a time. (For details of the method, Dr. Mitchell's paper in the *Lancet*, 1911, i, 225—abstract in *Medical Annual*, 1912, 510—should be consulted). Electrical methods are of doubtful utility.

The most useful drug in atonic dilatation is strychnine ($\frac{1}{24}$ gr. t.d.s.), but alkalis and carminatives may also be used (*see* Flatulence). Tonic aperients will be required for coexisting constipation. Salines should be avoided.

Lavage and operation are both contra-indicated in atonic dilatation; but the wearing of an abdominal support is sometimes required (*see* Gastroptosis). *Robert Hutchison.*

STOMACH, DILATATION OF, ACUTE POST-OPERATIVE.—This condition is by no means uncommon. Its recognition is of the utmost importance, as unless treated early and energetically it is inevitably fatal.

Although it may arise after operation in any part of the body, it most often occurs after those upon the kidney and gall-bladder. As soon as the condition is suspected, the patient should be placed prone and the foot of the bed raised. The stomach tube should be passed, and the stomach kept empty by tube as often as necessary. Operative treatment is never indicated. The condition may arise after, and in spite of, gastro-jejunostomy.

James Sherren.

STOMACH, FOREIGN BODIES IN.—The treatment will depend on the form, consistency, and size of the article swallowed. If it is thought that the foreign body is likely to pass, a diet of porridge or mashed potatoes should be given, but no purgatives. The patient should be *x*-rayed, and the exact location of the foreign body determined. It must be remembered that its weight may displace the stomach, and it may be necessary to examine after a bismuth meal. If the foreign body is giving rise to no symptoms, no hurry is necessary.

If natural discharge is impossible owing to the size, shape, or number of the foreign bodies, or if symptoms are produced, immediate operation should be resorted to.

In most cases it will be necessary to open the stomach. The incision in the stomach should be transverse to its long axis, and after removal of the foreign body it should be closed with a continuous stitch of fine chromic gut through all its coats, and buried with a continuous Lembert stitch of the same material. It may be possible to remove the foreign body, after the abdomen has been opened, by means of forceps such as Brünings' or Bilton Pollard's.

If the foreign body is in the duodenum, an attempt should be made to push it back into the stomach and extract it from there: only if this fails should the opening be made in the duodenum.

James Sherren.

STOMATITIS.—The mouth cavity under normal conditions contains many varieties of micro-organisms. Should the local resistance be decreased from any form of trauma these organisms may attack the tissues and give rise to inflammatory changes. In other cases, specific organisms may gain entry through the intact or injured mucosa and be the cause of a definite series of pathological changes. As a general rule, however, there is some underlying condition, such as bad hygiene of the mouth, exhaustion following infective disease, or the absorption of some poison, which specifically lowers the resistance in the mouth. The forms of stomatitis are usually classified according to the form of pathological lesion present; the following are the principal varieties:—

1. **Catarrhal Stomatitis.**—This is dependent upon many causes, such as oral sepsis especially around the teeth, the presence of injury, irritation from tobacco and spirits and gastric disorders. It may also appear in the course of various specific fevers.

In the treatment, it is necessary first of all to attend to any underlying cause. Any carious teeth should be removed, the teeth sockets made as aseptic as possible, and any irritant which has been administered should be stopped. The bowels should be kept freely open, and a mouth-wash of potassium chlorate ordered. This latter drug, which has a remarkably beneficial effect in cases of stomatitis, may also be given internally.

2. **Aphthous Stomatitis.**—This condition is more commonly seen in poorly-fed children and in those in ill-health, being especially found in association with gastric disorders.

The treatment should be chiefly directed towards the improvement of the general health, whilst potassium chlorate may be given internally and locally. The application of boro-glycerin will relieve the pain; but if only one patch is present and is associated with much pain, the greatest relief often follows the application of silver nitrate. (*See also* THRUSH.)

3. **Ulcerative Stomatitis.** — This condition is not uncommon in young children especially among the poorer classes, and not infrequently follows some infectious disease such as measles. It may follow a catarrhal stomatitis. In certain cases it occurs as an epidemic, and thus appears to be due to a specific organism.

In the early stages, attention to the general health, the use of cleansing mouth-washes and the application of potassium chlorate, locally and internally, is sufficient to bring about a cure. In more advanced cases, especially those associated with marked general disturbances, it is often better to administer an anæsthetic and to cleanse the teeth, a

even the ulcers on the mucosa, by scrubbing them with a soft tooth-brush and a solution of potassium chlorate. In the after-treatment, a generous diet should be given, and the administration of potassium chlorate continued.

4. **Mercurial Stomatitis.**—(*See* JAW, NECROSIS OF.)

5. **Gangrenous Stomatitis.**—This condition, often described as *cancrum oris*, is fortunately uncommon. It is most frequently seen in debilitated children, and follows one of the exanthemata, especially measles. It may commence as an ordinary form of ulcerative stomatitis, which rapidly extends and leads to destruction of the cheek. Often, however, the earlier stages are overlooked. When the inside of the mouth is examined, the mucous membrane, usually of the cheek, close to the angle of the mouth, is seen to be red and swollen. The centre may be ulcerated and show the presence of sloughs. The condition rapidly spreads, so that the whole cheek becomes swollen and hyperæmic. The mucous membrane becomes black and gangrenous, or shows a large adherent grey slough. In a short time the overlying skin also becomes gangrenous, and if the child survives sufficiently long the whole substance of the cheek is destroyed. At first there is marked pyrexia, but the patient rapidly passes into a state of collapse and profound toxæmia.

The treatment must be energetic from the commencement, and must not be limited by any consideration of the amount of deformity produced. Under a general anæsthetic, which must be sparingly administered, the whole cheek is split from the angle of the mouth to the anterior border of the masseter muscle. By this means good access to the diseased portion is obtained. The mouth being protected by a piece of gauze, all sloughs and necrotic tissues are cut away. The remaining portions must be swabbed with a strong antiseptic, pure carbolic acid being best for this purpose. Care must be taken that none of this falls on the healthy tissues. After it has been allowed to act for five or ten minutes, it should be carefully swabbed away with a weak carbolic lotion. The wound at the side of the mouth must then be lightly plugged with gauze, and a large fomentation applied. Subsequently the mouth is frequently dressed and syringed with Sanitas or weak carbolic lotions. The general health must be maintained as far as possible; and should the child survive, a plastic operation will have to be performed at a later date in order to overcome the deformity.

Albert J. Walton.
(Revised by E. C. Lindsay.)

STONE.—(*See* CALCULUS.)

STRABISMUS.—(*See* SQUINT.)

STRICTURE OF THE URETHRA.—(*See* URETHRAL STRICTURE.)

STRUMOUS DACTYLITIS.—(*See* BONE, TUBERCULOUS DISEASE OF.)

STRYCHNINE POISONING.—(*See* CRAMP; POISONING.)

STUMPS, TREATMENT OF.—The ideal stump is of suitable length for the instrument maker. It is covered by skin and subcutaneous tissue, not redundant, but freely mobile over the bone end. The scar is linear, not infolded, and shows no sinus. Muscle over the bone end is probably a disadvantage. The ideal stump has no pain or tenderness, x rays show no necrosis of bone, and the joints above have a full range of movement without deformity.

For some years amputations resulting from the war will form the majority, and hence the probability that the stumps were infected originally is very great. The possibilities of adherent nerves, tender nerve-bulbs, necrosis of bone, and trouble after re-amputation are all greater than in civilian work. The infection lurks especially in the scar-tissue, in the perivascular lymphatics, and in the calcified granulations on the ends of the bones.

During convalescence after an amputation we have learnt the necessity of preventing deformity in the joint above the amputation, and in maintaining by passive exercises a full range of movement, and the advantage in the lower limb of providing a temporary walking instrument. The best all-round appliance is the plaster pylon.

Stumps may require treatment because: (1) They are of unsuitable length; (2) Adherent nerves give pain; (3) Nerve bulbs are tender; (4) There is persistent infection; (5) There are tender spurs of bone.

1. Stumps of Unsuitable Length.—

Upper Limb.—A *thumb* should never be sacrificed, and the same applies to a single *finger* if the skin is intact.

In amputations through the *wrist*, the bony projections of the styloids are apt to cause chafing, the wrist in the artificial limb is lower than in the normal limb, and the forearm bucket has to be laced up the whole length of the forearm. Hence re-amputation should be advised, and may be done through the pronator quadratus or above this muscle. If re-amputated through the pronator quadratus, the patient has good pronation and supination in the stump, but it is apt to be cold and cyanosed ; if the re-amputation be above the pronator quadratus, the pronatory power is less, but the stump is well nourished.

If the original amputation (infected) has been through the *lower third of the forearm*, probably there is a cross-union by bone between the bone ends, and re-amputation may be advised to secure pronation and supination.

In *upper forearm* stumps, we must have at least three inches of ulna. Otherwise the artificial limb is pushed off, by the action of the biceps and the stumps of the forearm muscles, when the elbow is flexed. Should this happen, the patient's elbow may be disregarded and the forearm stump accommodated in a special socket in the artificial limb. Excision of the stumps of the muscles arising from the internal and external condyles (Openshaw's operation) may be tried, the nerve-trunks being shortened at the same time ; but on the whole the best treatment is re-amputation one inch above the condyles.

Amputations through the *elbow* give bad stumps for the same reasons that make wrist stumps so unsatisfactory. The stump should be shortened so that the bone is divided one inch above the condyles, the sharp corners of the supracondylar ridges being nipped off or burred down with a bone-file.

In *arm* stumps, every bit of bone is valuable. For an artificial limb which can be manipulated at the shoulder, there must be at least an inch and a half of humerus below the anterior axillary fold. I have provided a longer stump by removal of the anterior axillary fold, leaving only the clavicular part of the pectoralis major (as in carcinoma of the breast), but I am not enamoured of the result. The shoulder-cap of the artificial limb fitted on the top of the short stump of humerus, if nothing be done, makes that shoulder appear wider. On the other hand, the nerve-trunks are well protected in the axilla from pressure by the stump of humerus. On the whole, if the humerus stump be too short to transmit movement to an artificial limb, I should advise removal of the bit of humerus, and at the same time shortening of the stumps of the brachial plexus as high as possible without undue pulling on them.

Lower Limb.—A single *toe* becomes deformed inevitably, and is better removed.

An intact *first metatarsal* is of the utmost importance in walking, and its head must be covered with sound skin.

In any *foot* stump, failing a sound first metatarsal, I recommend a Syme's amputation. All tarsal stumps are liable to secondary deformities, and are probably covered with very poor skin. The stump from a subastragaloid amputation is too long, it has a bad lower end for weight-bearing, and the bony projections formed by the malleoli are a nuisance. The stump left by a Pirogoff is too long and pointed, and there is possibly non-union or mal-union between the os calcis and the tibia. Therefore the treatment is a Syme's amputation, with the flaps a little shorter than those described by Syme originally, and with the nerves carefully shortened.

Leg stumps in the lower third are bad, being cyanosed and liable to ulceration. Stumps in the middle third of the leg are excellent for length, the fibula being divided for preference a quarter of an inch higher than the tibia. Stumps in the upper third of the leg are very valuable if an artificial limb with active movement at the knee can be fitted. To do this, it must be possible for the surgeon to hook two fingers behind the stump of tibia at the inner side when the patient flexes the stump. Should we be faced with a stump shorter than this, it may be hidden in a socket provided in the artificial limb bucket, but better treatment is re-amputation, either through the upper part of the condyles, or by a Stokes operation.

Amputations through the *knee* (Stephen Smith) give poor stumps. They are rather long, they cannot usually carry very much weight on the end, and the mobile patella

prevents accurate fitting of the bucket. They can be fitted with a serviceable limb, but are better changed into a Stokes amputation. In this the femur is divided just above the condyles, the cartilage is sawn off the patella, and the latter applied to the cut end of the femur. In this supracondylar division of the femur, there is no need for pegs or any foreign body to hold the patella in place.

Thigh stumps depend for their efficiency mainly on the length of bone remaining, and every half-inch is valuable. A stump with less than three inches of bone below the lesser trochanter cannot be fitted with an artificial limb in which the owner controls movement at the hip. Moreover, these short thigh stumps often show flexion or abduction deformity, so that re-amputation through the hip or through the neck of the femur is quite justifiable and enables the artificial limb used for hip-joint amputations—the 'tilting-table'—to be fitted much more satisfactorily. In this re-amputation it is important to cut all the muscles as short as possible, especially the adductors, and to shorten the sciatic nerve to the sciatic notch. The 'tilting-table' is a sound proposition, and will enable a man to walk several miles.

2. **Adherent Nerves.**—Adherent nerves in stumps may give rise to local tenderness, to hyperæsthesia, and even to epileptiform fits. The end of the nerve may lie embedded in the skin scar, or it may be tethered to the scar by a band of fibrous tissue. If the tenderness in the scar be local, and a particular nerve seems to be involved, the portion of nerve implicated must be excised. If the tenderness be local, but no particular nerve appears to be affected, then the scar-tissue in the region of tenderness must be removed widely. If the tenderness be general (and no bony cause found in the *x* ray), the stump must be rested for six months, and then, if still tender, all the scar tissue removed. This latter comes practically to a re-amputation. The treatment of the rare cases of causalgia in stumps is beyond the scope of this article.

3. **Bulbous Nerves.**—The formation of a bulb on the end of a cut nerve is physiological; but if after section the end becomes infected, then the bulb is usually larger than normal, and tender. The bulb should not be tender after four weeks from the amputation; but we do not operate for a tender bulb till three months after the amputation, to give a reasonable chance for the tenderness to clear up. If, of course, the tender bulb is adherent to the scar, or buried in scar-tissue, it must be operated upon at once. There is no prospect of recovery with adherent bulbs, and there is a danger of 'neuritis' spreading up the nerve.

As a general rule, tender bulbs are above normal in size, but the size of a bulb is no indication for operation. Should the tenderness appear some time after an artificial limb has been fitted, probably the stump has shrunk, so that the bucket is now ill-fitting.

In the removal of bulbs, the main point is surgical cleanliness. It is important to plan the nerve division so that the new bulb will not be exposed to pressure from a bony prominence, from the bucket of the artificial limb, or from being covered by skin alone. It is unwise to exert traction on the nerves before division. The simplest method, and an effective one, is to crush the nerve in a clamp at the point selected for division, and transfix the crushed portion with a fine catgut ligature. Should the bulb be very adherent, there is no necessity actually to remove it, so long as a segment of nerve above be removed with these precautions.

4. **Persistent Infection.**—

Bone pain.—It is necessary to emphasize that the complete healing of a stump for weeks or months does not preclude the possibility of a sequestrum being present, and therefore all painful stumps, and all stumps before fitting an artificial limb, must be *x*-rayed in two planes. The sequestrum may follow the primary amputation or a secondary amputation, and in the former may be very small because free drainage was provided. The presence of a sinus often coincides with a sequestrum, but the removal of the latter is done as a result of examination of the *x*-ray plates and the localization. The sinus may lead to the sequestrum, and should always be explored in view of the possibility of a silk ligature or foreign body being the cause. After removal of the sequestrum, whether through another incision or by enlarging the sinus, free drainage must be provided. The blind scraping of a sinus cannot be too strongly deprecated.

Chronic abscesses occur in stumps apart from bone disease. They may be associated with the presence of a foreign body, either metal, a silk ligature, or a small piece of cloth.

In other cases no cause can be detected, and they are due to the recrudescence of suppuration in a patch of scar-tissue. The abscesses must be opened, any foreign body removed, free drainage provided, and possibly treatment by an autogenous vaccine instituted.

5. **Spurs.**—These occur frequently in stumps which have been infected. They are masses of bone from the cut end, spreading most commonly into the adductor muscles of the thigh, or sometimes into the deltoid in arm amputations. They may follow also the line of a discharging sinus. Spurs are common, but spurs giving rise to symptoms are rare. If we come to the conclusion that a spur is the cause of symptoms, then the spur must be removed. The removal of an adductor spur is effected through an incision at the inner side, the long saphenous nerve is divided short on the way, the spur is removed after incision of the periosteum at its base, and the raw bone surface covered with a flap of fascia to form a new periosteum. *Robert Milne.*

STYES.—(*See* EYELIDS, DISEASES OF.)

SUBMAXILLARY ABSCESS.—(*See* ABSCESS.)

SUBPHRENIC ABSCESS.—This condition, depending as it does in most cases upon failure to recognize the necessity for the early surgical treatment of the disease originating it, is undoubtedly becoming less common. Its usual causes are acute appendicitis, perforation of duodenal and gastric ulcers, and suppurative affections of the liver and biliary passages.

Treatment consists in free drainage. When complicating acute appendicitis, it is sometimes possible to drain through the abdominal incision employed for removal of the appendix. In some of the cases of right anterior subphrenic abscess due to perforation of a duodenal or pyloric ulcer, this may be done from the front. The majority, however, are best treated by posterior drainage in a line with the angle of the scapula. After pus has been found by the exploring needle, three inches of the rib below the needle should be removed. If the pleural cavity is not obliterated, the diaphragm is firmly sutured to the intercostal pleura with catgut, and the diaphragm incised and the abscess drained by a large tube. *James Sherren.*

SUFFOCATION.—(*See* DROWNED, TREATMENT OF THE APPARENTLY; LARYNGEAL OBSTRUCTION; POISONING.)

SUNSTROKE.—In all countries exposure to excessive heat, and particularly if the ventilation is bad, may result in vertigo, nausea or vomiting, and attacks of syncope, especially in alcoholic subjects. In these cases of heat exhaustion, the patient should be placed on his back in as cool a place as possible, all clothing loosened, and cold water dashed on the face and chest. After recovery from the immediate effects, a brisk purge should be given, and errors in clothing, diet, and ventilation remedied, as attacks are liable to recur. It is of special importance that the lining of the helmet should be red or orange, for prevention both of original attacks and of recurrence.

In the graver forms there is hyperpyrexia, and more active measures are required. Cold, or if possible iced, baths should be given. If no bath is available, the patient should be rubbed with ice or placed in an ice pack. The rectal temperature must be constantly observed, and the treatment stopped when it falls to 104°, as the fall will continue, and collapse may occur.

After the bath or pack, the patient should be wrapped in blankets, and stimulants given if required. In cases where the respiration ceases during the hyperpyrexia, artificial respiration should be carried on, as recovery may be possible even then,

Venesection is rarely of any value, and is often injurious.

In the mild forms, as well as in the severe, there may be troublesome sequelæ. Of these, mental irritability, insomnia, loss of memory, and headache are the more common. Careful regulation of the course of life, including restricted diet, prohibition of stimulants and opiates, moderate exercise, and mental rest, are of most importance. Any, even the slightest, errors in refraction must be corrected by the use of suitable glasses, and any causes

of 'eye strain' avoided. Smoked or tinted brown or yellow (not blue) glasses should be worn outside the house, even if the glare is not noticeable. Drugs are better avoided, but small doses of potassium iodide 1 to 5 gr. may be useful. *C. W. Daniels.*

SUPPRESSION OF URINE.—(*See* URINE, SUPPRESSION OF.)

SWEATING, EXCESSIVE.—(*See* HYPERIDROSIS.)

SWEATING, OFFENSIVE.—(*See* PERSPIRATION.)

SYCOSIS.—It is necessary in the first place to exclude the important imitators of this disease—ringworm and impetigo. That being done, the writer's experience is that the particular reason for the want of success which so often attends the treatment of this disease is want of vigour. The disease is treated with too much respect. The value of antiseptics is practically very much diminished by the fact that it is almost impossible to get them to penetrate to the bottom of the follicles in which lie the germs which cause the disease. Antiseptics have their uses in preventing the spread of the disease from one part to another along the surface, but they are powerless to destroy the germs at the bottom. For these counter-irritation is indicated, and it is to their counter-irritative powers that many antiseptics owe their reputation in sycosis. Blistering fluid is often most useful. Strong solutions of sublimate in spirit of wine really act as counter-irritants rather than as antiseptics, and the counter-irritating ointments, such as the acid nitrate of mercury, are often useful.

Although it cannot be claimed, and is not claimed, that these methods are always successful, they are at all events infinitely more so than the older methods of mild antiseptics.

Along with these applications there is no doubt that treatment is facilitated if the hairs growing from the diseased follicles are removed. This is generally comparatively easy to do, but it is questionable whether much benefit results from wholesale epilation, except it be that it is a rather severe form of counter-irritation.

In the *x* rays we have a remedy which has the power of producing both epilation and counter-irritation. There is no doubt that far too much has been claimed for the treatment; the improvement is often so striking at first that one regrets all the more that it is so often only transitory. All the same, we have in the *x* rays a valuable addition to our means of attack, and sometimes the continuance of the rays up to the production of a considerable reaction is followed by satisfactory results.

In the writer's opinion, there is probably no disease, with the possible exception of lupus, in which so much may be hoped from vaccine therapy, as sycosis. Probably the best results are got from a vaccine prepared from the patient's own cocci; but if this cannot be procured, a mixed staphylococcal vaccine may be used instead. The disease is sometimes apparently aggravated by the first injection, but improvement soon sets in, and is in the writer's experience much more thorough than that following, for example, the *x*-ray method. The doses should not be too numerous. Opinions differ, and each should only record his own experience without criticizing others. The writer allows at least ten days to elapse between the injections, and he has no faith in enormous doses.

In the majority of cases no general treatment is indicated, but there is a form of sycosis occurring in a delicate class of young men in whom the administration of cod-liver oil is most beneficial. It is to these cases, probably, that cod-liver oil owes its reputation in sycosis. *Norman Walker.*

SYNOVITIS, TRAUMATIC.

1. **Acute.**—The treatment of acute synovitis depends, to a large extent, upon the cause, the correct diagnosis of which is essential to success. Simple synovitis, due to traumatism, will be dealt with here; for the treatment of the other special forms the reader is referred to the articles dealing with GONORRHŒA; JOINTS, TUBERCULOUS DISEASE OF; PYÆMIA; RHEUMATISM; SYPHILIS.

The treatment detailed below is that appropriate to all cases of sprained joints, though it must be remembered that in all but the mildest cases it is advisable to have a radiogram

taken. The discovery of an unsuspected fracture in the neighbourhood of the joint, e.g., a carpal bone in a sprained wrist, may call for considerable modification of the treatment. In the knee—the commonest joint to be the subject of synovitis—injury to important structures, such as the internal lateral ligament, a semilunar cartilage, the crucial ligaments, or the tibial spine, may have occurred, and the special signs of these should always be sought for. The general treatment for all cases, modified if necessary on account of some complication such as those mentioned above, falls under four heads: rest, compression, massage, and electrical treatment of the muscles controlling the joint.

Rest, at any rate for the first day or two, is essential; but whether this should be carried to the extent of immobilization on a splint must depend on the particular joint affected and upon the severity of the injury. In the absence of gross injury to important structures, if a splint is used at all it should not be retained for more than twenty-four to forty-eight hours. The position in which the joint is rested should be that which is best suited to recovery of the full movements, and this often differs from the natural position of rest of the joint. For instance, if the shoulder is damaged, the arm should be fixed in 60° abduction, slight flexion, and slight internal rotation; normal full voluntary movements will be obtained with far greater ease from this position than if the arm had been bound to the side in the usual way. The wrist should be dorsiflexed; the knee should be straight; if a displaced cartilage is wedged between the bones and prevents full extension, this must be released by full flexion and rotation, and finally extension, of the joint. In most cases, though not in all, the position should be identical with that selected when ankylosis is desired or expected.

Compression of the swollen joint is obtained by applying a good layer of cotton-wool, and over this a firm bandage: a second layer of wool and a second bandage are added, and even a third and fourth layer over these, as suggested by Sir Robert Jones. This compress is removed daily for massage, and reapplied.

The time that should elapse before massage is begun must necessarily vary with the severity of the case, the pain, etc., but in the severest cases skilfully performed massage may be of benefit after two or three days. In most cases massage may be commenced after twenty-four hours. The safest guide is the effect produced by the massage. If the pain is aggravated and the swelling increased, it is obvious that this active treatment must be further delayed. Though some pain may be produced by the first sitting, it is often followed by relief, and the next sitting is found most comforting. In order to prevent the formation of, or to stretch, adhesions before they have become firm, active and passive movements should be commenced as early as possible, and here again the surgeon must be guided by the result of such treatment. If some increase of swelling is produced, the movements should be discontinued for a few days, and then recommenced. Gradual stretching of adhesions before they have become firm is always to be preferred to forcible breaking down of the bands; but when, owing to their resistance or the nervousness of the patient, such is found to be impossible, the joint may be forcibly manipulated under general anæsthesia. Such a proceeding should never be necessary in cases properly treated from the first. After such manipulation, active and passive movements should be encouraged from the first. Firm pressure should be applied continuously in the intervals till the joint is well, and may be advantageously continued for some time after the patient has resumed his occupation. In the case of the wrist, active and passive movements of the fingers and thumb must be insisted upon from the very first.

A word of warning may here be given with regard to passive movements in cases of injury of the elbow-joint, particularly in young children. Active movements should be relied upon rather than passive. The utmost gentleness is necessary, or a mass of bone may form in the brachialis anticus (myositis ossificans traumatica) and cause considerable limitation of movement and call for a return to complete immobilization of the joint. This is more likely to occur when one of the bones—usually the humerus—has been broken near the joint. Faradic stimulation of the muscles of the limb, as urged by Rowley Bristow, is most useful and, in the case of the knee, essential. The stability of the knee-joint depends to a large extent on the tone of the quadriceps, while the support of the vasti is essential to the synovial membrane to prevent accumulation of fluid. Finally, special exercises to increase the power of the quadriceps, etc., should be persevered with. A sprained knee-joint should not be considered cured till the full range of movements is

possible, including rotation of the tibia, and the quadriceps is at least as big as that of the other leg. A bandage should only be used for a few days after the fluid has disappeared.

2. **Chronic.**—It is again essential that any aggravating cause, such as a displaced cartilage, loose body, or hypertrophied synovial fringe, which may have given rise to repeated attacks of acute or subacute synovitis, should be discovered, as when one of these is present a cure can be obtained only by operation. In the absence of these, the joint should be treated as for acute synovitis, viz., by compression, massage, electrical stimulation, and physical exercises. It must be remembered that, as a rule, chronic effusion into the knee after an injury is due, not to a continued inflammation, but to a laxity of the ligaments and muscles about the joint, and is often the result of the inefficient treatment of the case in its early stages. Rest is to be avoided as a rule. In some cases the application of a Martin's bandage may promote absorption of the fluid and prevent its re-accumulation. In others, particularly in rheumatic patients, hot-air baths, which produce active hyperæmia, combined with massage, may effect a cure. By many ionization is strongly recommended in these cases: the value of this method seems to be doubtful. If these fail, the fluid may be withdrawn by means of a fine aspirating needle, and firm pressure applied. This failing, the joint may be emptied and washed through the aspirating needle with normal saline or some irritating and stimulating fluid such as 1–2000 sublimate solution. If the latter is used, a final irrigation with sterilized water is necessary to prevent a too violent reaction. Formalin in glycerin (2 per cent) has also been used as an injection into the joint, repeated at intervals. If yet again the treatment fails, the joint should be opened and examined for the presence of thickened synovial fringes, etc. The possibility of the hydrops articuli being due to the tubercle bacillus should not be forgotten. If hypertrophied fringes of synovial membrane are present, they should be clipped away; if very extensive, the largest only should be removed, the rest swabbed over with sublimate lotion, and the joint closed and elastic pressure applied. Since removal of the whole of the synovial membrane must necessarily lead to considerable impairment of movement, this should be undertaken only when it is of paramount importance that the joint should be firm and reliable, even though such can be obtained only at the expense of much of its mobility. Complete excision is the last resort if the joint remains painful.

H. A. T. Fairbank.

SYPHILIS.—Syphilis first manifests itself in a local sore or chancre, indicating the locality where the virus was first introduced, and the chancre is subsequently followed by various cutaneous and other manifestations which signal the general infection of the blood and the invasion of the whole system with the poison.

The initial lesion of syphilis usually presents itself in the form of an indolent ulcer, the local treatment for which is the application of some antiseptic powder or lotion. But local applications should be withheld, in cases in which the diagnosis is in doubt, until some of the secretion of the sore has been obtained with a view of ascertaining the presence of the spirochæte, since this organism is driven from the surface by antiseptic powders or lotions. Iodoform was formerly much employed as a dressing for the syphilitic chancre, but owing to its characteristic odour this substance was apt to arouse the suspicions of those familiar with its uses, and is now usually discarded, and replaced by other equally efficient substitutes, amongst which may be instanced dermatol, iodol, resorcin, europhen, aeroform, and orthoform. The sore having been carefully cleansed in warm water, the powder is dusted lightly over its surface, and a piece of lint is superimposed with a view of retaining the powder in contact with the sore, and of absorbing its secretion, while if the sore is on the outer aspect of the prepuce or on the sheath of the penis, the dressing may be secured in position by adhesive plaster.

The lotions usually adopted as a dressing for the chancre are the lotio nigra and the lotio plumbi, to which may be added tincture of opium (1 drachm to 1 oz.) if much pain is present. Excision of the chancre may be practised in situations in which no undue mutilation is involved, such as the preputial orifice in men and the labia majora in women; if this can be effected early, the subsequent course of the disease may be considerably modified thereby, and in some cases its further progress is arrested by this operation.

Neglect, privation, alcoholism, and debility may give rise to an unhealthy condition of the chancre, manifested by sloughing or phagedæna, which may cause serious destruction and mutilation of the affected parts. Treatment of this condition must be prompt

and energetic, and nothing is more effective than continuous application of hot water; this is best effected by the immersion of the patient in a hip-bath into which fresh supplies of water are constantly introduced in order to maintain the temperature. The stay of the patient in the bath may be regulated by the severity of the destructive process, and in an acute case immersion for twelve hours daily is advisable. In the intervals between the baths, the application of a lotion of tartarated iron, 20 gr. to 1 oz. water, is a valuable adjunct.

Of far greater importance than these local measures is the constitutional treatment by means of which the syphilitic virus is eliminated from the system. This treatment resolves itself into the administration of three remedies, arsenic, mercury, and iodine, of which the two former are far the more important, since they seem to act as an antidote to the syphilitic virus, whilst the latter is used to alleviate certain symptoms, and to promote the absorption of some of the products of the disease.

Owing to the invaluable researches of Ehrlich, the arsenical preparation salvarsan (606) was introduced in 1909, and this was followed later by neosalvarsan (914). These compounds marked a new era in the treatment of syphilis, though the claims originally made for them have been considerably modified by more matured experience. The salvarsan treatment was originally designated as the *therapia sterilans magna*, and it was claimed that one injection not only destroyed the germ of syphilis, but prevented any recurrence of the manifestations of that disease, and rendered the Wassermann reaction negative. Time and observation have proved that the claims formerly put forward were chimerical, and that, in order to effect a cure of the disease, these arsenical compounds must be supplemented by some form of mercurial treatment. Formerly salvarsan was administered intramuscularly, but it was found that this method had many counterbalancing disadvantages, principal amongst which were intense pain, severe constitutional disturbance accompanied by pyrexia, and possibly the formation of an indurated mass at the site of the injection, requiring incision or perhaps excision. The salvarsan preparations are now almost universally introduced by the intravenous method, which has the advantage of being painless except for the prick of the hypodermic needle, and of giving rise to no local disturbance. During and since the recent war the supply to this country of the original preparations has ceased, and recourse has had to be made to various modifications such as galyl, neodiarsenol, arsenobenzol (Billon), kharsivan and neokharsivan (B. W. & Co.), and luargol. In the experience of the writer, the most satisfactory of the salvarsan substitutes are galyl (French) and neodiarsenol (Canadian), and though none of these are endowed with quite the same activity or rapidity of action as the German preparations, the two above-mentioned have at any rate the merit of safety. The dose of galyl is 0·3 to 0·4 grm., and of neodiarsenol 0·45 to 0·6 grm.; they are both of them freely soluble in water, and require the addition of no neutralizing agent. The initial course consists of ten weekly intravenous injections, accompanied by one of the forms of mercurial treatment subsequently referred to. The apparatus for the introduction of the solution into the vein should be as simple as possible. I am in the habit of using a glass receptacle fixed to a metal stand, with a telescopic rod by means of which the glass vessel may be raised or lowered; to the vessel is attached about six feet of indiarubber tubing, in the end of which is inserted a metal tube with a stout hypodermic needle attached to it; about a foot from the termination of the indiarubber tubing a glass 'window' is inserted, by which the presence of air in the tube can be ascertained. Some of the distilled water is introduced into the glass vessel, and passed through the indiarubber tube in order completely to empty it of air, a very essential precaution, since the introduction of air into the circulation is productive of serious symptoms such as intense precordial pain and embarrassment of breathing. The skin at the bend of the elbow is rendered aseptic by the application of a solution of iodine and alcohol, and an indiarubber band is applied round the middle of the arm sufficiently tightly to obstruct the venous return, and is secured with Spencer Wells forceps; the needle is then introduced through the skin into the vein which stands out most prominently, usually the median basilic, and the indiarubber band promptly removed; about two ounces of distilled water are first introduced; this is succeeded by the solution to the amount of about two ounces, and this is followed by a further ounce of distilled water. If the needle misses the vein, a swelling of the subcutaneous tissue ensues, and the needle must then be withdrawn, and introduced into another vein

either in the same arm or in that of the opposite side. After the completion of the injection, a small pad of cotton-wool is placed over the puncture, and over this collodion is applied. For these injections the same preliminaries must be observed as for a surgical operation; a purge must be administered on the previous evening, and no food should be taken for four hours previously; after the injection the patient should abstain from food for three or four hours. In some cases, especially in the female sex, it is impossible to bring any vein into sufficient prominence, and then it is necessary to make an incision through the skin, for which purpose cocaine may be injected subcutaneously. It is hardly necessary to state that a certain amount of experience is requisite before these injections should be ventured on, but the technique can easily be acquired after witnessing its employment by one who is thoroughly conversant with the method. Some reaction may follow these injections, such as pyrexia, rigors, and mental depression; but since the recognition of the fact that these reactionary symptoms were due to some impurity in the water used as a vehicle, it is laid down as essential that the water should be distilled and re-distilled shortly before its use. In a few instances symptoms of delayed arsenical poisoning occur, as evidenced by severe desquamative dermatitis, jaundice, vomiting, anuria, and coma. These toxic symptoms may be treated by intramuscular injections of intramine (diorthoaminothiobenzene) 1·5 c.c., which not only increases the action of arsenobenzene and mercury, but also palliates the effects of metallic intoxication. The contra-indications to the employment of these preparations are chronic organic diseases of the kidneys, cardiac lesions, atheromatous arteries, diabetes, and alcoholism.

Mercury may be introduced into the system in various ways: by injection, either intramuscular or intravenous; by the skin, in the form of inunction; by the mouth, in the form of pills or mixtures. For intramuscular injections, both the insoluble and soluble mercurial salts are utilized; but the former are far more effective than the latter, and are more convenient both for the surgeon and for the patient, seeing that only one injection is required weekly, whereas the soluble preparations have to be injected daily. The most powerful and undoubtedly the most effective of the insoluble salts is calomel, suspended in sterilized oil or vaseline, the dose being $\frac{3}{4}$ gr. calomel to 17 min. olive oil injected once a week. The principal objection to its use is that it occasionally gives rise to very severe pain. Another efficient insoluble preparation is 'grey oil', consisting of hydrarg. pur. 1 oz., adipis lanæ anhyd. 4 oz., liquid paraffin (carbolisat. ad 2 per cent) ad 10 oz.; the customary dose of this preparation is 10 min. injected weekly; this is the formula which is mostly adopted for the treatment of syphilis in our military hospitals.

In the absence of symptoms of urgency, and where prolonged treatment is indicated, the basic salicylate of mercury has been recommended; the strength of the solution is 10 gr. suspended in 100 min. of liquid paraffin, of which the weekly dose is from 10 to 15 min.; it has the advantage of being less painful than the other insoluble preparations, but on the other hand its action is slow and uncertain.

Amongst the soluble salts may be mentioned mercury perchloride $\frac{1}{3}$ gr. dissolved in 7 min. of distilled water, to which is added sodium chloride $\frac{1}{6}$ gr.; mercury succinimide 1 gr.; mercury biniodide $\frac{1}{3}$ gr.; and mercury sozoiodol $\frac{1}{3}$ gr., with sodium iodide $\frac{2}{3}$ gr. The disadvantage of these soluble salts is that they have to be introduced daily or every other day; but this is to some extent counterbalanced by their comparative painlessness.

Whichever preparation is adopted, whether the soluble or the insoluble, every precaution must be taken against sepsis, and against injecting into blood-vessels or in the region of large nerve trunks. The skin of the patient, the hands of the surgeon, the syringe, and the material to be injected must be treated with the same precautions as regards asepsis as would be deemed necessary in any important surgical operation. The region usually selected is the buttock, the exact spot being the centre of a line drawn from the anterior spine of the ilium to the upper end of the intergluteal fold, this point being well above and to the outer side of the important vessels and nerves emerging from the pelvis through the great sacro-sciatic foramen.

Should treatment by intramuscular injections be decided upon, a primary course of from 12 to 15 weekly injections may be prescribed with the insoluble salts; or, if the soluble salts are preferred, from 25 to 40 injections, at first daily, then every other day, and finally twice a week.

Intravenous injections of a 1 per cent solution of cyanide of mercury were introduced into this country by the writer in 1896, but dropped into disuse owing to the necessity for their daily administration. They have been, for the past two years, reintroduced in my clinic at the Female Lock Hospital, and have met with such success that I regard this method as the most effective means at our disposal for the administration of mercury. The dose originally employed was 20 min. of a 1 per cent solution, but I now find that patients will tolerate doses of from 40 to 50 min. My practice now is to give one intravenous injection of a salvarsan substitute and five injections of cyanide of mercury a week, and allow the patient a day's rest from any treatment on Sunday. This course of treatment is continued for three months, and the Wassermann test taken three months afterwards frequently proves to be negative. The principal advantage of this treatment is the rapid subsidence of all symptoms ; the only disadvantages are the occasional occurrence of diarrhœa or gingivitis, both of which complications yield to the administration of appropriate remedies and to the interruption of the treatment for a few days.

The inunction treatment consists in the rubbing into the skin of a varying amount of mercurial ointment, according to condition, age, and sex of the patient, an average daily dose for an adult being 1 drachm. The procedure may be carried out either by the patient or by a skilled rubber, preferably the latter, each application lasting for about twenty minutes, by which time all the ointment will have been absorbed by the skin. It is advisable to vary the locality of the applications as much as possible, in order to avoid irritation of the skin, and the hairy parts of the body should be avoided, since the ointment is liable to set up eczema if applied in those regions. An average course of treatment consists of a daily inunction for thirty to forty days, but its duration will materially depend upon the condition of the patient's mouth and gums. The advantages of this method of treatment are, the rapidity with which the mercury is usually absorbed, and that it does not as a rule interfere with the digestive functions ; its disadvantages are, that the amount of mercury absorbed is variable and uncertain, that the treatment is uncleanly and consequently distasteful to many, and that its success depends upon the manipulative skill of the rubber or the patient ; it is contra-indicated in the presence of a general pustular syphilide, or in patients with a delicate and sensitive skin.

The simplest method of administering mercury, and the one which proves satisfactory in a large proportion of cases, is ingestion by the mouth. At the outset of the disease this is usually effected by means of pills in the form of pil. hydrarg., pil. hydrarg. cum creta, pil. hydrarg. tannatis, pil. hydrarg. salicyl., in doses of 1 to 2 gr., three times a day with a small quantity of pulv. opii in addition, should their ingestion be followed by colic or diarrhœa. Capsules of mergal or cholate of mercury ($\frac{3}{4}$ gr.), with tannate of albumin ($1\frac{1}{2}$ gr.), may be given at any stage of the disease ; at first one capsule three times a day the dose to be gradually increased to two, five or six times daily. It is quite as efficient in its action as the more familiar preparations above described, and is seldom followed by any gastric or intestinal derangements, and so is specially indicated in mild cases of syphilis where it is desired to prolong the treatment over a considerable period. In the later stages of the disease, a pill combining mercury and iodine may advantageously be prescribed, such as pil. hydrarg. iodid. virid. $\frac{1}{3}$ gr., or pil. hydrarg. iodid. flav. $\frac{1}{4}$ gr. The liquor. hydrarg. perchlor. may be given in doses of 1 drachm three times a day, and is indicated in cases of relapse, or where it is desirable to continue the use of the drug for a prolonged period. A mixture of biniodide of mercury—1 drachm liq. hydrarg. perchlor. with 5 gr. potass. iod.—is valuable in the later stages of the disease, in cases with a gouty diathesis, or when superficial ulceration of the tonsils and fauces is present. Mercury also may be administered in combination with arsenic, in the form of Donovan's solution, in 10-min. doses, in obstinate cases of syphilitic skin eruptions, especially in chronic desquamating papular syphilides.

In whatever form mercury is administered, the greatest attention must be paid to the hygiene of the mouth : before the commencement of the course, any decayed teeth should receive the attention of the dentist, and all tartar should be removed from the teeth by scraping. The teeth should be carefully cleansed with some antiseptic tooth powder or lotion after each meal, and the mouth should be frequently rinsed out with an astringent lotion, such as alum 10 gr. to the ounce, or a 20 per cent solution of listerine

Should gingivitis or stomatitis be induced by the mercurial treatment, a mouth-wash of alum or hydrogen peroxide should be employed, and these may be associated with one or two intramuscular injections of intramine in dosage of 1·5 c.c. The patient should be instructed at the commencement of treatment that his diet should be simple but nourishing, that exposure to cold and wet should be guarded against, and that the avoidance of stimulants is also advisable, since the therapeutic effect of mercury appears to be greatly modified if alcohol in any quantity is being taken at the same time. Smoking may be allowed in moderation in the absence of any lesions of the buccal mucous membrane, but should there be traces of syphilitic ulceration in that region, it should be given up entirely. The patient should also be informed as to the serious nature of the disease, the various methods by which it can be communicated to others, and as to the length of time during which the treatment should be continued.

In a large proportion of cases the administration of mercury by the mouth is productive of a perfectly satisfactory result, and as it does not entail any pain or inconvenience, it is probably the most suitable form for general adoption. But there are some patients who are intolerant to mercury taken in this manner, amongst whom may be mentioned those suffering from gastric derangements, such as gastritis, dyspepsia, or dilatation of the stomach, also those in whom the drug gives rise to intense colic and diarrhœa which are not counteracted by the addition of opium. Further, since the absorption of mercury thus administered is slow and often uncertain, some other method must perforce be adopted in cases of severe and malignant syphilis, and where it is desirable to get the patient under the influence of the drug with as little delay as possible. More energetic and effective measures are at our disposal in the form of mercurial inunctions and intramuscular injections.

The extent and duration of the mercurial treatment will materially depend upon the constitution and idiosyncrasies of the patient, and also upon the form of treatment adopted; since the introduction of salvarsan, the length of the mercurial treatment has been materially shortened, and it is seldom necessary to prolong it for more than two years; occasionally one year's treatment will suffice, if the salvarsan treatment has been carried out thoroughly as a preliminary to mercurial treatment. The best guide to the duration of treatment is the Wassermann test, which, if found negative on three occasions taken at three months' interval, will be an indication for the cessation of treatment. The condition of the gums will give some indication as to the duration of the mercurial course, and as to whether the drug is producing the desired effect; a slight gingivitis and increase in the flow of saliva is not always an unwelcome sign, since it indicates that the remedy is affecting the system. The bodily weight of the patient should be carefully noted during the course, and any material diminution will indicate some modification in the treatment. The presence of albumin in the urine will necessitate smaller doses given under very careful supervision, and any gastric and intestinal derangement will call for an interruption in the treatment.

There are cases in which the treatment above indicated fails to subdue some of the symptoms, and here recourse must be had to some of the preparations of iodine; this drug is as a rule required only in the later stages of the disease, when it is of value in promoting the absorption of the products of syphilitic inflammation; thus, it may be administered with advantage in cases of syphilitic ostealgia involving the cranial or other bones, such as the clavicle, ulna, or tibia, in tuberculous and ulcerative syphilides, in syphilitic glossitis, and in tertiary affections of the brain, the eye, the viscera, and the bones. It is usually given in the form of iodide of potassium, but the iodides of sodium and ammonium are equally efficacious and less depressing.

Brief allusion may be made to a method of treatment known as Zittmann's, which consists in the imbibition of a large quantity of a decoction of sarsaparilla, mixed with other ingredients, including calomel. Two quarts are taken in the course of the day; the patient is kept in a room at a temperature of 80° F., is purged, and kept on a light diet. The treatment is depressing, and is only adopted in intractable cases which will not yield to the ordinary measures, and the ingestion of the same quantity of hot water will produce a very similar result.

In addition to the general treatment outlined above, the majority of the symptoms may be treated on general surgical principles, but there are certain manifestations

which may call for special local measures. Ulcerating condylomata must be kept dry and treated by a dusting powder consisting of equal quantities of calomel and starch ulceration of the tongue, throat, or any part of the buccal mucous membrane should be painted over with a solution of hydrarg. perchlor. 4 gr. to the ounce, and as a mouth-wash or gargle a weaker solution of hydrarg. perchlor., ½ gr. to the ounce, may be used. Palmar and plantar psoriasis and the chronic desquamating papular syphilides may be treated by the application of oleate of mercury in strength of 5 to 10 per cent.

Antenatal Treatment of Syphilis.—Special attention has recently been directed to the treatment of syphilis in pregnant women, and with most satisfactory results. Formerly such cases were relegated to the workhouse infirmary, and did not receive the attention they deserved. At the London Lock Hospital for Women during the past two years 217 pregnant women have been under treatment. Of the babies born, 119 were the offspring of syphilitic mothers; of these, 12 died, 6 were stillborn, and 101 survived. 9 were born with a + + Wassermann reaction, which in 6 cases was shortly rendered negative by treatment. In the 98 babies born of gonorrhœal mothers, no case of ophthalmia neonatorum occurred. The treatment of the syphilitic mothers was carried out on the lines already mentioned, viz., one intravenous injection of a salvarsan substitute and five of cyanide of mercury per week; this treatment was continued after the birth of the children if the mothers were able to suckle them; if not, the infants were treated with intravenous injections of one of the arsenical compounds, either into the external jugular vein or into the superior longitudinal sinus through the anterior fontanelle; the dose of arsenical compound employed was 1 mgrm. per pound weight. The mercurial treatment of the babies was by inunctions of unguentum hydrargyri daily or by pulvis hydrargyri cum creta ¼ gr. t.d.s. *J. Ernest Lane*

SYPHILIS OF THE NERVOUS SYSTEM.—Syphilitic processes in the nervous system, as in other localities, respond readily, as a rule, to antisyphilitic remedies. This statement does not, however, hold good for those neurone degenerations in the etiology of which syphilis plays an essential rôle (tabes, general paralysis of the insane); nor can these remedies be expected to replace nervous tissue which has been destroyed by the disease, as is the case in cerebral softening, a consequence of thrombosis of a syphilitic vessel, and in so-called syphilitic myelitis, which is of similar causation. The administration of large doses of iodide, in a case of syphilitic cerebral thrombosis, will not restore the softened area, and may indeed do harm by lowering the blood-pressure and facilitating the extension of the thrombus. In such cases, antisyphilitic remedies should only be employed after the acute process has passed off, when they are indicated with the object of influencing the changes in the arterial walls, and thus diminishing the risk of similar accidents in future.

When syphilis of the nervous system is recognized, energetic treatment is called for. Anyone who has had much experience of cerebral syphilis can probably recall cases of gummatous meningitis which have been treated for weeks with small doses of antisyphilitic remedies without improvement, and in which the administration of larger doses was at once effective. If the diagnosis is correct, the drug will almost always be well borne.

Mercury, the iodides, salvarsan, and neosalvarsan are the known remedies which have a pronounced influence upon syphilitic processes. The principles in the treatment of syphilis of the nervous system are similar to those adopted in relation to syphilis elsewhere. Since the relative efficacy of the iodides and mercury is a matter of uncertainty it is advisable to administer them simultaneously.

Mercury may be given by the mouth, by inunction, or by intramuscular injections. Oral administration is convenient, but has the disadvantage that the drug is somewhat uncertain in its action, and may cause gastro-intestinal disturbance. Corrosive sublimate in the form of liquor hydrargyri perchloridi, ½ to 1 drachm thrice daily, may be given in a mixture, together with potassium iodide. Grey powder, combined with Dover's powder if there is any tendency to diarrhœa, is useful in the case of children suffering from congenital syphilitic lesions. Inunctions of mercury are on the whole more effective while they are not so liable to derange digestion. A drachm of unguentum hydrargyri or of the unguentum cinerei, should be used daily. The ointment is to be rubbed into the skin for twenty minutes each day, the locality being varied in order to avoid local irritation

his procedure should be continued for a month. Intramuscular injections have the advantage that they act more rapidly, and that the exact quantity of the drug introduced into he system is known. When the symptoms do not respond to the methods above described, njections into the muscle may be employed. Salicylate of mercury, gr. ½, made up to 10 per cent solution in liquid paraffin (10 gr. in 100 min.), may be injected into the gluteal region. Six injections should be given at intervals of four or five days. Needless o say, rigid aseptic precautions must be employed. Optic atrophy is, according to some uthorities, a contra-indication to mercurial treatment. Nonne's plan, when optic atrophy s present, is to take the field of vision and make an ophthalmoscopic examination at requent intervals, and if either the visual acuity or the ophthalmoscopic appearances how signs of progress, to discontinue the treatment.

Iodides are of the greatest value in syphilis of the nervous system. The potassium alt is commonly employed. It is well to commence with 5 to 10 gr. thrice daily, the dose being rapidly increased to 90 gr. in the twenty-four hours ; larger doses than this do not appear to be attended with any special advantage. Two or three drops of Fowler's olution, if added to the iodide, will help to counteract any ill effects produced by the drug.

When iodides and mercury are being administered, the patient should be enjoined o pay special attention to the condition of his gums and teeth. The effects of treatment re usually apparent within a few days if the remedies are given in sufficiently large doses. ymptoms which still remain after the drugs have been given for a period of from six to en weeks will probably be permanent (Gowers). Very occasional cases are met with n which both mercury and the iodides are ineffective ; indeed, cases have been recorded n which syphilitic lesions have developed during an antisyphilitic course.

Salvarsan and its substitutes have now been given an extended trial in syphilis of he nervous system. They are of undoubted use in cerebral and spinal syphilis, though he results obtained in tabes and general paralysis are disappointing. Intramuscular njections were, in the first instance, employed ; but of late the intravenous method has been almost exclusively used, the advantage of this method being the absence of pain nd the possibility of measuring the exact dose. The technique of salvarsan therapy is described elsewhere. Advanced cardiac and vascular degenerations are regarded as ontra-indications to its use. At one time, salvarsan therapy was looked upon with conderable suspicion, for numerous instances of relapse, and of subsequent auditory and acial paralysis, were observed, while occasional fatalities were recorded. It is now enerally recognized that there is little danger if the drug is given with due precautions. he circumstance that the peripheral palsies disappear during salvarsan administration learly indicates that they are due to the disease and not to the remedy. A dose of 0·2 ncreasing to 0·6 grm. should be given once a week for a period of three weeks. Although t is questionable whether the results obtained by the use of salvarsan are more pronounced han those observed in cases thoroughly treated with mercury and iodides, there can be o question as to the more rapid action of the former. Mercurial treatment should be imultaneously administered. *Edwin Bramwell.*

TABES DORSALIS (Locomotor Ataxy).—It will be convenient to consider treatnent under the following headings : (1) Antisyphilitic treatment ; (2) General therapeutic neasures and drugs which appear to influence favourably the course of the disease ; (3) ymptomatic treatment.

1. **Antisyphilitic Treatment.**—The existence of a very close relationship between abes and previous syphilis is almost universally acknowledged ; indeed, the opinion is enerally held that without syphilis there would be no tabes. It is unnecessary here to o more than refer to this very intimate association. The circumstance that in only a ery small proportion of those who have been infected by syphilis does tabes subsequently evelop, shows that other influences must play a part in determining its incidence ; lthough there is evidence which suggests that differences in the character of the syphilitic irus may be a factor of importance in this connection.

The establishment of this etiological relationship has hitherto not proved of great herapeutic value, for cases of tabes are rarely met with in which very striking improvement s attained by the exhibition of mercury and the iodides. In some, however, these remedies ertainly do good, and there is general agreement that an *antisyphilitic course is indicated* :

(*a*) When syphilitic manifestations are present; (*b*) When there is a history of comparatively recent syphilitic infection (say within five years), especially when the patient has never undergone a thorough syphilitic 'cure'; and (*c*) In doubtful cases in which it is difficult to exclude a true syphilitic process giving rise to symptoms closely simulating tabes (pseudo-tabes).

There is still some difference of opinion as to the advisability of mercurial treatment in all cases of tabes. The opinion, however, seems to be gaining ground that in all cases which have not previously undergone a thorough mercurial course this drug should be used. The existence of optic atrophy must be regarded as a contra-indication to the treatment, since it is affirmed that mercury has a prejudicial effect upon the degenerative process in the optic nerves. Mercury may be administered by the mouth, by inunction, or by intramuscular injection. If the first method is adopted, the liquor hydrarg. perchlor. may be given in doses of half to one drachm. The disadvantages of oral administration are the somewhat uncertain action of the drug and its tendency to produce gastro-intestinal derangement. The action of mercury is more certain when it is administered in the form of unguentum hydrargyri, ½ drachm of which should be used as an inunction twice daily. The inner aspects of the thighs and the axillæ are the most suitable places for the application. The ointment is to be rubbed in for twenty minutes at a time, the same piece of lint being used for successive inunctions. It is advisable so to apply the ointment that the same region of skin is not used oftener than once in two days. A tepid bath may be taken immediately before the evening inunction, since it appears to assist absorption. The mercurial treatment should be continued for a fortnight, but stopped on the appearance of redness or soreness of the gums, pronounced salivation, or marked loss of weight. This 'course' may be repeated at intervals of two months.

Potassium iodide should be given if tertiary symptoms exist, and continued for six weeks in increasing doses of 10 to 40 gr. three times a day. In some cases, gastric disturbance is set up by the iodide, and may interfere with its administration; it is therefore important to correct, so far as possible, any pre-existing gastric irregularities before the iodide treatment is commenced. Aromatic spirits of ammonia, or ammonium carbonate, may be added to the iodide with advantage, with the object of counteracting the depressing effect of this drug when administered for a lengthened period. If the iodide is given in large doses, the patient should be confined to bed. Toleration of large doses may be regarded as an indication that the remedy is doing good.

Salvarsan or one of its substitutes may be used in cases of tabes which manifest a tendency to progress, although there does not as yet appear to be incontrovertible proof that it is more effective than mercury in this disease. Injections of neosalvarsan 0·6 to 0·9 grm. may be given weekly for a period of six weeks, alternating with intramuscular injections of mercury when there is evidence that the morbid process is progressive. The writer has seen several cases in which the beneficial effect upon the lightning pains has been pronounced. Optic atrophy is not a contra-indication provided that small doses are given (Nonne).

The intrathecal administration of salvarsanized or mercurialized serum and of neosalvarsan is a procedure by no means devoid of danger, and the available data do not appear, in the writer's opinion, conclusively to indicate that this procedure is more efficacious than other methods of administration.

2. **General Measures and Tonic Treatment.**—Statistical inquiries, as well as individual observations, have demonstrated that certain factors in addition to syphilis may take a share in determining the development of tabes. Thus chills, over-exertion, sexual excesses, and trauma appear in certain cases to have acted as exciting causes of the disease. If follows that special precautions should therefore be adopted to avoid these influences, which, since they may excite the disease, are no doubt capable of accelerating its progress.

As Maloney has recently pointed out, in his valuable monograph on locomotor ataxia, the tabetic is often a syphilitic neurasthenic, and the treatment of his mental attitude will often do more good than intensive measures directed against the physical disorder. It is usually unnecessary to inform a patient in the early stages of the disease that he is suffering from tabes, and if the physician feels compelled to do so, he should clearly indicate that the diagnosis of locomotor ataxia does not imply the outlook which it did in

former years. Again, no purpose is served by asking the patient whether he has acquired syphilis or been exposed to infection. The aim of the physician should be to avoid producing unnecessary depression, and to instil a hopeful outlook as far as this is justifiable.

The necessity of freedom from the worries of business should be emphasized, and the avoidance of over-fatigue insisted upon.

The peculiar susceptibility to falls in the barometric pressure, which is so often manifested in increased severity of the pains, is an indication for warm clothing. A warm, dry climate, such as that of Egypt or Northern Africa, is very suitable during the winter months for those who can afford it.

Loss of weight, which cannot but predispose to the development of complications and associated lesions, is a common accompaniment of severe cases of the disease; hence the need for a nutritious and fattening diet and of careful attention to the organs of digestion. Alcohol, if allowed at all, is to be strictly limited. Moderate smoking is permissible. The tabetic should be strongly advised not to marry, and he must be warned of the bad effect which indulgence in sexual excesses may have upon the disease.

General massage is of distinct service in cases in which there is much wasting. Faradism may be used with advantage when the muscular nutrition is defective; it is also sometimes of use in the treatment of certain subjective sensory disturbances. In the opinion of some authorities, the application of a weak galvanic current to the spine, for five to ten minutes at a sitting, one pole being placed between the shoulders, the other over the sacrum, has been attended with benefit. A course of hydrotherapy at some of the German baths, e.g., Wildbad, St. Moritz, may be worthy of trial by those to whom money is no object.

The suspension treatment, introduced some years ago, has been abandoned, later observations having failed to corroborate the favourable impression at first created by this procedure.

Nerve stretching is no longer employed.

Drugs which have obtained some reputation in the treatment of this disease, as in so many of the degenerative affections of the nervous system, are arsenic and strychnine. Ten minims of tincture of nux vomica, combined with from 2 to 5 min. of Fowler's solution, is a convenient form of administration. Strychnine must be given with caution, since in some cases it appears to increase the severity of the pains. Aluminium chloride, in doses of 2 to 4 gr. thrice daily, has been specially commended by Gowers; it may be given in combination with arsenic. Nitrate of silver, a remedy the efficacy of which was at one time greatly lauded, still has a few adherents. It may be given in the form of a pill, $\frac{1}{4}$ gr. thrice a day, made up with unguentum kaolin. Gastric disturbance is apt to be produced, and discoloration of the skin results if the drug is long continued; therefore after a fortnight its administration should be stopped, to be again resumed after a month's interval. Other remedies, such as iron and quinine, may be of value from their general tonic action.

3. **Symptomatic Treatment.**—A peculiar feature of tabes consists in the multiplicity of distressing symptoms to which the disease may give rise, and the almost unrivalled variety of types which it may in consequence present, according to the predominance of one or more of these symptoms in the clinical picture.

Lightning pains which present great variations both in their intensity and in the frequency of their occurrence, and which affect especially the lower limbs, are rarely absent; indeed, they constitute the most common symptom of the disease. When the pains are not severe, 5 to 10 gr. of phenacetin will often disperse them. If they are more intense, phenacetin (20 gr.), phenazone (20 gr.), or exalgin (2 gr.), may be exploited. Pyramidon (5 to 10 gr.), and acetylsalicylic acid (20 gr.), have been highly recommended by Oppenheim, and may be tried. Potassium iodide is sometimes of use, as is salicylate of soda. Osler finds that nitroglycerin, given in increasing doses and continued over a considerable period, is of undoubted value where the blood-pressure is raised. Omnopon in doses of $\frac{1}{3}$ gr. may prove of use when the remedies above mentioned prove ineffective.

Hot fomentations, massage, and a gentle faradic or galvanic current to the affected part, are sometimes beneficial. The local application of lint sprinkled with chloroform and covered with oiled silk, according to Gowers, may relieve superficial pain. Counter-irritation is occasionally useful. High-frequency currents have at times a temporary beneficial effect.

All these measures may be of use when the pains are not of great intensity; but in those cases in which their excruciating character is unbearable, morphia is usually the one drug which will bring relief. Only as a last resource should morphia be used, and the patient should not be allowed to give himself hypodermic injections; for not only is there a great risk of the development of the morphia habit, but, in addition, the drug has such a lowering effect upon the will and emotional control as to render the fight against the pains when they recur still more difficult. The effect of salvarsan upon the pains in some cases has already been referred to.

Ataxia occupies a prominent place among the serious symptoms of the disease. It has long been recognized that an increase in the ataxia is apt to follow confinement to bed but it is only of recent years that any real success has been obtained in the treatment of this symptom. To Fraenkel we owe the introduction of a plan of treating the ataxia which has been attended with most encouraging results.

The appreciation of the rationale of the method is essential to its successful application. The procedure consists in the re-training of co-ordination, the possibility of which is shown by the observation that if an ataxic patient repeats a movement several times in succession, the ataxia in connection with that movement becomes less pronounced. Before the treatment is commenced, it is advisable to point out to the patient that his difficulty in walking is not due to weakness of the muscles, but to an inability to co-ordinate —i.e., that as a consequence of destruction of certain afferent neurones, he receives a defective and erroneous idea of the movement which he is performing, with the result that the movement is at fault. The tabetic must learn to forget the 'movement memories' which served his purpose while in health, and proceed to acquire a new series of 'movement memories' corresponding to the impressions which he *now* receives through those neurones which remain intact. The patient must realize that it is the care and precision with which the movements are carried out, rather than their very frequent repetition, which are so essential to success. Suitable exercises will suggest themselves to the physician. Even when the ataxia is slight, the value of simple exercises, such as walking along a straight line, is considerable. The exercises should be practised systematically two or three times a day, for half an hour at a time, stopping at once, however, if the patient's attention begins to wander, or if there are any indications of fatigue. There can be no question that the results obtained by the method of treatment above described are often largely due to the suggestion of the physician and the confidence he is able to impart, for all who have had much experience of tabes must clearly recognize that emotional disturbance plays a prominent rôle in connection with the ataxia, and that moral support and encouragement may do much to correct this symptom. A course of general massage and faradism is a valuable adjunct when the muscles are flabby and weak from disuse.

Such complications as grave cardlac disease, bladder trouble, a disorganized joint or a perforating ulcer of the foot, may contra-indicate this treatment. Again, mental changes interfering with the patient's power of concentration may render the treatment unsatisfactory; while severe and prolonged attacks of lightning pains and gastric crises because of the confinement to bed which they necessitate, may counteract any improvement derived.

Hyperextension of the knees, which gives rise to difficulty in walking, may be materially benefited by suitable orthopædic appliances.

Disorders of micturition are among the most serious symptoms to which the tabetic is liable. Difficulty in emptying the bladder is very common, incontinence is of frequent occurrence, while occasionally complete retention is met with.

In every case of tabes it is necessary to impress the patient with the importance of passing water at frequent and short intervals (every two hours), and of attempting at each act of micturition to expel all the urine the bladder contains. It is well to keep in view the possibility of a co-existing stricture of the urethra, a complication not uncommonly overlooked in tabes, which, when present, calls for appropriate treatment. When there is difficulty in passing water, 5 min. of liquor strychninæ, thrice daily, is sometimes of use. Incontinence of urine is at times distinctly benefited when a like quantity of tincture of belladonna is taken three times a day. If there is reason for believing that the bladder is being imperfectly emptied, a catheter should be passed after the act of micturition, and the residual urine estimated; should it exceed ten ounces, it is probably best, as Si

William Gowers suggests, to draw off the urine at regular intervals, treating the case, in fact, exactly like retention dependent upon an enlarged prostate, and with the same object in view, viz., the prevention of cystitis and its dreaded sequela, pyelonephritis. The residual urine should be drawn off two or three times in the twenty-four hours, with the hope that in the course of a short time it will diminish in quantity. There is little, if any, additional risk of producing a cystitis in passing a catheter in cases of tabes, provided that rigorous aseptic precautions are taken. When cystitis actually exists, the bladder should be washed out twice daily with weak boracic solution; while remedies such as hexamine, acid phosphate of soda, etc., may be given internally, according to special indications.

Constipation is often a troublesome symptom. Fluid extract of cascara, 5 to 20 min., combined with tinct. nucis vom., 5 min., three times a day, may be sufficient to produce a daily evacuation of the bowel. It is often necessary, however, to employ enemata.

Crises.—Visceral crises may be a source of great distress to the tabetic. Among these, gastric crises are most often met with. During an attack, the patient should be fed per rectum. Oxalate of cerium, 5 to 10 gr., given in a wafer paper, has been said to do good, and may be tried. A minim of liquor trinitrini may be given, three times a day, in cases where the blood-pressure is raised. But, as a matter of fact, if the crises are severe, morphia given hypodermically is usually the only drug found to be of any real value. The problem of the administration of morphia in these cases is a most difficult one, for in the writer's experience there is no patient so likely to acquire the morphia habit as the tabetic who suffers from gastric crises. It is of great importance to feed up the patient in the intervals between the attacks, in order that he may recover his strength and make up the loss of weight which is produced thereby. In several cases of tabes with very severe gastric crises, the seventh to ninth dorsal posterior roots have been divided. This operation, which was originally proposed by Foerster, has been attended with promising results. The procedure is a severe one, and only to be undertaken in extreme cases.

Laryngeal crises may sometimes be relieved by the inhalation of nitrite of amyl; if this fails, painting the vocal cords and neighbouring parts with a weak cocaine solution may be found to be of service.

In the case of rectal, vesical, and intestinal crises, the application of a mustard leaf or hot fomentation to the abdomen is worthy of trial. The various analgesics above mentioned may also be employed, but when the crises are severe, morphia, given in the form of a suppository, will usually be found to be the only effective remedy.

Optic atrophy, when present, frequently goes on to complete blindness. In these cases ataxia is often absent or ceases to progress if the amaurosis becomes complete, while the pains are usually slight. Mercury and potassium iodide are contra-indicated in these cases. Strychnine given hypodermically tends, it has been affirmed, to retard the atrophic process in the optic nerves. An initial dose of $\frac{1}{60}$ gr. per diem should be gradually increased until the physiological action of the drug is apparent.

Pain in the back may sometimes be relieved by counter-irritation. Failing this, the remedies previously mentioned as effective in the treatment of the lightning pains should be resorted to. Girdle pains are to be treated on similar lines. Cutaneous hyperæsthesia, a somewhat uncommon symptom of the disease, is at times markedly benefited by the application of a weak faradic current with a fine wire brush electrode. The effect of a warm bath may also be tried in these cases.

The treatment of perforating ulcers or tabetic arthropathies which are giving rise to inconvenience may be relegated to the surgeon.

From these remarks on the symptomatic treatment of tabes, it will be seen that the physician has considerable therapeutic scope, with a distinct prospect that his endeavours will not be altogether in vain.

Finally, the tabetic should be advised, in the words of Erb, "to live the life of an old man, simple, abstemious, quiet, and regulated". If the case belongs to the category of early stationary tabes with unobtrusive symptoms, prophylactic precautions alone are required; if, on the other hand, the case is advancing, active antisyphilitic measures and suitable symptomatic treatment must be adopted, according to the special indications present.

Edwin Bramwell.

TACHYCARDIA.

This is a term used rather loosely, signifying a considerable increase in the frequency of the heart's action. It is a condition far from uncommon, and though in the majority of instances it is a temporary manifestation, it may be continuous.

Before considering the treatment in any case, it is imperative to have clearly in mind the cause of the acceleration. In some patients a frequent heart action is normal; in others, of an emotional nervous temperament, very slight stimuli produce marked changes in the rate of the heart. Whatever causes enfeeblement or irritability of the myocardium, such as exhausting diseases, influenza, diphtheria, cachexia, or anæmia, induces a liability to attacks of tachycardia. In such patients the accelerated action of the heart is the result of an increased stimulus production at the sinus, or an increased excitability and irritability of the cardiac musculature. Pyrexia and certain toxins such as alcohol and atropine act similarly by diminishing the inhibitory influences. Over-secretion of the thyroid gland is an important factor, tachycardia being in some instances the first manifestation of Graves' disease. In an enfeebled heart, physical exertion may produce a tachycardia which persists for hours, instead of quietly settling down within a few minutes of the exertion. One notices also a peculiar liability to undue frequency of the heart in cases of mitral stenosis, a condition very little influenced by drugs. If no reason for the tachycardia can be discovered, one should suspect some obscure toxæmia, such as pulmonary tuberculosis without pyrexia or physical signs, or an infection by the *Bacillus coli* or other organism.

In the above instances of tachycardia, the manner of the heart's action is normal though frequent, and the contraction of the heart starts in the usual site; but there is another series of important groups in which this is not so.

Auricular fibrillation, the tachycardia being continuous, or in paroxysms with normal intervals. There is no co-ordinate contraction of the auricle—its muscular wall is in a condition of fibrillation or fine tremor.

Auricular flutter, characterized by enormously increased frequency of the action of the auricle, the contractions originating in an unusual site, the ventricles responding to every second, third, or fourth systole of the auricle, varying with the degree of heart-block.

Paroxysmal tachycardia, or greatly increased frequency of the heart, the contraction originating in some abnormal place in the auricles, in the ventricles, or in the auriculo-ventricular node.

The tachycardia in the first group generally shows some slight irregularity. In the second and third groups the pulse is unusually frequent, 120 to 250, and quite regular in time. Alternation may be observed. The paroxysms begin suddenly and cease abruptly. Though the rate is not influenced to any degree by emotion, pyrexia, or exercise, exercise usually increases the irregularity in a case of auricular fibrillation, while it tends to diminish the irregularity in auricular flutter.

Treatment.—In many instances frequent heart action is associated with palpitation, and the treatment described for the latter complaint will be equally helpful for the tachycardia.

In the nervous patient, a cold sponge down in the morning, followed by skin-rubbing exercises, will give tone to the vasomotor system. For these patients gentle exercise in the open air is to be recommended. For the palpitation and tachycardia of D.A.H. (Army classification), games and remedial exercises in the open air are most beneficial.

When the tachycardia appears after exhausting diseases such as influenza or diphtheria, or when it is associated with anæmia, rest is essential and gentle massage should be employed, together with some preparation of iron, quinine, and strychnine, such as Easton's syrup.

In the tachycardia of mitral stenosis ammonium bromide should be given at night as :—

℞				
	Ammonii Bromidi	gr. xxx	Liquoris Arsenicalis	℥ij
	Spiritus Ammoniæ Aromatici	℥xv	Aquam Menthæ Piperitæ	ad ℥ss

All alcoholic and other stimulants must be avoided, and coffee and tea should only be taken in the greatest moderation. It is well to curtail the amount of tobacco smoked, and sexual excess must be avoided.

In any obscure case, corroborative evidence of hyperthyroidism should be carefully sought for.

The apyretic tachycardia of some cases of pulmonary tuberculosis is extremely ominous, and the general condition must be vigorously attacked by complete rest and free diet, and the tentative administration of minute doses of tuberculin may be considered.

The treatment of the tachycardia due to *auricular fibrillation* is fully described in another article (*see* Heart, Irregularity of). The essentials are rest and the exhibition of some member of the digitalis group until the heart is slowed down, any marked hypertension being modified.

Similar treatment is necessary for the cases of *auricular flutter*. Tincture of digitalis, 1 drachm daily, increases the block at the junctional tissues, and the ventricular rate is diminished. The flutter may give way to fibrillation ; and this may be looked upon as a step towards recovery, as the fibrillation sometimes ceases and a normal action of the heart supervenes. When the tachycardia is due to fibrillation or flutter of the auricle, life should be taken very easily ; confinement to bed is necessary for some patients if the discomfort is considerable, and more particularly if digitalis is being administered in large doses.

In *paroxysmal tachycardia* nothing gives consistently good results. The attacks begin and end suddenly, apparently independently of treatment. As a result of the paroxysm the heart may dilate and evidence of cardiac distress may follow, though often there is nothing more than slight discomfort. It is better for the patient to rest, and this becomes imperative if the heart shows signs of dilatation. Vigorous slapping of the chest, the application of an ice-bag to the precordium, counter-irritation, vomiting, the discharge of flatulence, or pressure on the vagus has at times appeared to terminate an attack. Small doses of digitalis appear to be of some service, and, if the patient is sleepless, chloral or morphia may safely be employed. The mode of life between the paroxysms should be carefully regulated. Coffee, tea, alcohol, and tobacco should be used in great moderation, and the heart should not be subjected to any undue stress. (*See also* MYOCARDIAL FAILURE.)

John Hay.

TÆNIA.—(*See* WORMS, INTESTINAL.)

TALIPES, ACQUIRED.—The term talipes, or club-foot, signifies an abnormal attitude of the foot, with consequent disturbance of its relationship to the leg or of that of its component parts to one another. The expression 'acquired club-foot' indicates that the faulty attitude has developed at some period after birth, and contrasts the condition with the congenital deformity which is present when the child is born. The deformity may occur in any one of the four directions in which the foot can be moved, or it may be compound, in two directions at the same time. The subjoined table will show the more common varieties of acquired club-foot, and briefly indicate the attitude in each variety.

Simple Talipes	Equinus. Foot pointed—heel drawn up. Calcaneus. Heel dropped—front of foot raised. Varus. Foot inverted. Valgus. Foot everted.
Compound Talipes	Equinovarus. Foot pointed and inverted. Calcaneovalgus. Heel dropped—foot everted. Equinovalgus. Foot pointed and everted.

Another deformity which falls within the scope of our definition of club-foot, but is not included in the above classification, is the condition called claw-foot, or pes cavus.

Acquired club-foot is essentially due to prolonged maintenance of a faulty attitude by the affected limb. There are many conditions which result in this maintenance of abnormal position, but granted that any one of them has come into action, the nature of the deformity produced will depend more upon the habitual attitude assumed by the foot in the new circumstances than upon the circumstances themselves. For example, if the muscles of the leg be paralyzed from poliomyelitis, and the foot be allowed to hang down habitually, the deformity will be one of equinus or equinovarus. If, on the other hand, the patient attempts to walk on the paralyzed limb, the superincumbent body weight will in all probability produce a condition of calcaneus or calcaneovalgus. The maintenance of the foot in bad position in soon accompanied by contraction of such structures as the tendo Achillis, plantar fascia, tibialis posticus, or ligaments such as the plantar ligaments and the posterior and internal lateral ligaments of the ankle-joint. This contraction fixes the foot in its abnormal position, and it is impossible to rectify the deformity until the tight structures have been divided or stretched.

By far the commonest cause of acquired club-foot is infantile paralysis affecting the muscles of the leg to a greater or less extent, and as a consequence the condition is often called paralytic talipes. But club-foot can also be acquired as the result of contraction following burns, or during the course of disease of the ankle-joint or of the bones of the leg ; it is a constant accompaniment of the central palsies of infants, i.e., spastic paraplegia and infantile hemiplegia. Again, talipes equinus can be acquired during the treatment of fractures, or of any disease, because the bedclothes have been allowed to weigh upon the foot and keep it in the extended position long enough to overstretch the flexors of the ankle while the tendo Achillis contracts ; this condition has been

called talipes decubitus. Acquired talipes may result from peripheral neuritis, or may be produced by accidental section of, or pressure upon, one of the popliteal nerves, or by forcible straightening of a flexed knee without section of the tendo Achillis. Lastly, the condition may be hysterical.

The only point in the diagnosis is the differentiation from the congenital deformity. The distinguishing features, such as the absence of deformity at birth, the history of symptoms suggesting an attack of poliomyelitis, the fact that movement of the foot is limited in one direction only, whereas the congenital club-foot is a rigid one, the wasting of the calf, the poverty of the circulation, and the under-development of the part, clearly indicate the paralytic talipes, and should the deformity be due to any of the other causes mentioned above, the history and general features of the case will usually throw light upon the origin of the mischief. The hysterical club-foot is usually, but not always, an equinovarus, and is associated with much spasm and rigidity while the patient's attention is fixed upon the foot. The deformity disappears under anæsthesia, or even if the attention can be attracted to other things.

As a rule, acquired talipes is not accompanied by much osseous change in the foot, unless the deformity is an old-standing one or has been produced by actual bone or joint disease.

Treatment.—In the treatment of acquired club-foot the deformity must be corrected, and steps must be taken to prevent it recurring. Thus the means at our disposal fall under two heads: (1) Operative; (2) Mechanical. The operative measures are tenotomy, with or without forcible correction with the wrench, tendon transplantation, removal of portions of redundant skin, and joint fixation or arthrodesis, with or without removal of portions of the tarsal bones. Mechanical apparatus has two great functions—it may be used to prevent the development of an acquired club-foot, and it is of the greatest value in the post-operative treatment of the club-foot once the deformity has been corrected—it cannot replace operation if the deformity has already developed. Splints and irons should combine simplicity with effectiveness; they should tend to correct the deformity for which they are employed, and they should be designed so that they may be applied without interfering with the circulation in the affected limb.

In the detailed account of the treatment of each variety of talipes it is assumed that the condition is paralytic; mention, however, is made of any modification necessary in dealing with cases due to other causes.

Paralytic Talipes Equinus is a simple deformity. The tendo Achillis is shortened, and the patient walks upon the heads of the metatarsal bones or even upon the dorsum of the toes; the flexors of the ankle and often the extensors of the toes are overstretched and useless.

Lengthening the tendo Achillis by a 'tendon slide', i.e., the Z-method performed subcutaneously, usually allows the foot to be brought up to a right angle; if the posterior ligament of the ankle-joint is shortened, the shortening can be overcome by the use of the hands or a Thomas wrench. As a rule, if the foot be kept in a good position in a light rectangular splint for a sufficiently long time, and efficient massage be employed, the anterior tibial group of muscles will recover their tone and will themselves prevent the deformity recurring.

If the anterior muscles fail to recover, it is advisable to perform an arthrodesis of the ankle by removal of the cartilage covering the bones entering into the articulation, this resulting in a short fibrous ankylosis being produced with the foot in good position. It is not advisable to resort to this measure in a young child, nor indeed is it often necessary in the case of simple talipes equinus, as the muscles frequently recover when the stretching effect of the deformity has been removed. In order to ascertain whether they will recover, it is only necessary to increase for the moment the equinus deformity, and observe if any extending movement of the toes can be performed voluntarily or even reflexly; if there is the slightest flicker of extension the muscles will recover their tone, provided the foot be kept at right angles for a sufficiently long time and the limb be well massaged. In talipes equinus due to spastic paralysis, simple tenotomy is not advisable, as the proximal end of the divided tendon will retract up the leg, and a condition of calcaneus will develop. The best procedure in such a condition is division of the tendon by the Z-method through an open incision, and mooring the two ends with strands of chromic catgut after the foot has been brought almost to a right angle. Talipes equinus due to old disease of the ankle or tarsus, with ankylosis in a faulty position, is best dealt with by removal of a wedge of bone from the dorsum of the foot as near the ankle-joint as possible.

If a walking-iron is necessary in the post-operative treatment of talipes equinus, a simple and effective mechanism is a light iron running down the back of the calf and turning at right angles at the heel to run forwards for a short distance in the substance of the

boot. This iron is secured at its upper end by a leather strap and buckle, and another strap should be applied round the ankle, so that the heel may fit into the angle of the iron.

Talipes Calcaneus is a condition which varies in severity with the age of the patient, and the treatment consequently depends upon the same factor. The young child should be allowed to walk only in a back-iron such as described above, but bent at an angle rather greater than a right angle at the heel, while at night a splint holding the foot in the equinus position should be worn. If no recovery takes place in the calf muscles, an arthrodesis of the ankle—the joint being attacked on the posterior aspect—will secure a good result. In performing this operation, in addition to removal of the cartilage from the bones, a wedge is taken from the back part of the body of the astragalus. This procedure results in an ankle-joint with an immeasurably strong posterior ligament which retains the foot in good position, and the long prominent heel which is such a feature of talipes calcaneus is shortened. In older cases, there is not merely calcaneus, but the foot is arched and the plantar fascia contracted; this deformity is sometimes termed **Calcaneocavus**, and there may be superadded an element of varus or valgus. For such cases two distinct operations are indicated:—

1. Tenotomy of the plantar fascia and removal of a wedge from the dorsum of the foot. In this way the hollow-arched condition of the foot is removed, even if the calcaneus deformity be made to appear more exaggerated.

2. Posterior arthrodesis, as described above, is performed, and the straight foot moved down at the ankle-joint into good position.

It is hardly necessary to add that some weeks ought to intervene between the two operations. Other measures which have been tried for this talipes calcaneocavus are implantation of the peronei and flexor longus hallucis tendons into the tendo Achillis, but the results obtained by the procedure first described are much more satisfactory.

In recent years an operation devised by Whitman has been practised by many surgeons. This consists in removal of the astragalus, displacing the foot backwards, and fitting the front part of the os calcis into the tibiofibular mortice.

Equinovarus is a common combination of deformity in two directions; the foot is pointed and inverted, the tendo Achillis is shortened, as is the plantar fascia, and possibly the tibialis posticus and the internal lateral ligament of the ankle-joint; the head of the astragalus usually forms a marked prominence on the dorsum of the foot. The flexors of the ankle are either permanently paralyzed or overstretched, and so weak as to be useless. Treatment here depends on the condition of the muscles; if they give any indication that they will recover their tone when the deformity is corrected and the foot has been kept in good position for the necessary period of time, then tenotomy of the plantar fascia and tendo Achillis is sufficient. The foot must be kept overcorrected in a club-foot shoe, and the muscles be well massaged until such time as they can hold in good position without aid. If recovery of the weak or paralyzed muscles fails to take place, and the tendency to deformity persists, the operation of tendon-transplantation should be performed. A slip of the tendo Achillis may be fixed to the peroneus longus tendon, but a better method is to shift the tendo Achillis to the outer side of the os calcis and to take a functionating tendon at the front of the ankle, say the tibialis anticus or the extensor proprius hallucis, and reinsert it into the outer side of the foot. In this way the foot is braced up in a good position, and the muscles, in virtue of their new insertions, serve to keep it right. If the extensor muscles be considered useless, the treatment to be adopted is an arthrodesis of the ankle-joint, with exsection of the wedge from the outer side of the body of the astragalus; this operation is usually the one adopted in adolescent or adult cases, and the results are extremely satisfactory. It is sometimes necessary to combine tendon-transplantation with arthrodesis in order that a good and permanent correction of the deformity may be obtained.

Whatever be the operative measure in a case of talipes equinovarus, the after-treatment is the same. At first the foot must be kept overcorrected in a club-foot shoe, or in a plaster-of-Paris dressing reaching from the toes to below the knee. Later on, when the patient is allowed to walk, he should wear an iron running down the inside of the ankle, and turning to fit into a brass socket which crosses the heel of the boot; the play which takes place between the iron and the socket allows movements of flexion and extension of the ankle. The upper end of the iron is fastened to the leg by strap and buckle, and an

additional strap round the ankle holds it snugly to the iron and ensures that the foot is kept everted. In addition a strap of metal is worn along the outer edge of the sole of the boot to lift up the front part of the foot. The patient should continue to wear the club-foot shoe at night, even though he is walking with a boot and iron in the day-time, as the foot tends to relapse into the old position during sleep.

Talipes Calcaneovalgus is one of the most common varieties of paralytic club-foot. In the child six months to two years old the condition looks more like flail ankle, or at any rate pure valgus ; the foot can be overflexed at the ankle and everted and abducted. In such cases the surgeon is tempted to perform an arthrodesis of the ankle, with removal of a wedge from the inner side of the body of the astragalus ; but this operation will surely fail if performed at an early age—the ankylosis will not be a firm one, and so the deformity will recur. Therefore, if arthrodesis seems necessary, it is better to fit the child with a walking-iron until he reaches the age of six or eight years, when the operation can be performed with much greater likelihood of success. If investigation of the muscular power leads the surgeon to consider that a tendon transplantation will suffice, good results are obtained by shifting the tendo Achillis to the inner side of the os calcis, and at a subsequent operation implanting the extensor proprius hallucis tendon into the periosteum of the inner side of the neck of the first metatarsal bone. This procedure will only serve for pure valgus deformity. Calcaneovalgus will require the treatment described under calcaneocavus.

Talipes Equinovalgus is a not uncommon variety of acquired club-foot. Here the foot is pointed and abducted, the toes are often dorsiflexed, and there may be a condition of hallux valgus, resulting from attempts at walking on the deformed foot. The tibialis anticus and posticus are the muscles which are not acting, and the tendo Achillis is contracted. Excellent results can be obtained in this condition from treatment, which is carried out in three stages : (1) Shifting the tendo Achillis to the inner side of the os calcis ; (2) Some weeks later, elongation of the Achillis tendon ; (3) Later still, implantation of the extensor proprius hallucis into the inner side of the foot.

In all cases of valgoid deformity the foot must be kept inverted for several weeks after the operation. This can be done with an outside straight splint or by means of a plaster dressing. The iron with which the patient walks is planned in the same way as the iron for talipes varus, but is placed on the outside of the ankle. In addition, the heel of the boot should be elongated, so that it comes under the instep, and it should be made deeper on the inner than on the outer side ; this throws the body weight on to the outer side of the foot. A tin shoe, which holds the foot a little above the right angle, and inverted, should be worn at night for some months.

Pes Cavus, or Claw-foot.—This condition, not falling under any of the headings mentioned above, is still included in our definition of club-foot. It is a deformity which causes extreme pain, and interferes with locomotion to a very grave extent. The foot is short, thick, and stubby ; there is enormous exaggeration of the normal antero-posterior arch, so that the under surface of the foot presents in bad cases little more than a deep cleft between the prominent heads of the metatarsals and the heel. The toes are dislocated backwards at the metatarsophalangeal joints, and acutely flexed at the first row of interphalangeal joints ; there are usually large corns over the prominent heads of the metatarsal bones, and pressure here causes exquisite pain. The plantar fascia and plantar ligaments are much shortened, as are the extensor tendons of the toes and the glenoid ligaments of the interphalangeal joints. There is often a degree of equinus or even varus associated with claw-foot. No condition leads to greater disablement of the foot, and in none does the treatment demand more from the ingenuity and skill of the surgeon. The etiology of this deformity is obscure ; it has been attributed to infantile paralysis causing paresis of all the muscles, especially the flexors of the ankle and the lumbricales and interossei ; but no explanation has been found for this particular deformity after the muscular paresis. Signs of general disease of the nervous system, such as Friedreich's ataxy, should be sought for, particularly if the foot deformity is accompanied by scoliosis.

Treatment varies with the severity of the deformity. Division of the plantar fascia and correction of the overarched foot with the wrench are necessary preliminaries in every case. The tendo Achillis may have to be divided, but this must not be done until all the

wrenching is finished, as the resistance of the Achilles tendon is necessary while the arch is being straightened out with the wrench. In milder cases this is all the operative treatment necessary; the patient may be allowed to walk in a boot, the heel of which has been lowered, and which has a bar of leather half an inch thick running across the sole opposite the necks of the metatarsals. Some splint, e.g., a club-foot shoe, which will keep the foot straightened out, must be worn at night.

In certain cases benefit has been obtained from implantation of one or more extensor tendons into the heads of corresponding metatarsal bones. Severe cases, and those which tend to relapse, are best treated by removal of portions of metatarsals near their bases. This should be done through separate incisions on the dorsum of the foot over each bone. Tenotomy of the extensor tendons and of the tight structures on the plantar side of the interphalangeal joints will allow the toes to be straightened. On no consideration should there be any operation wound in the sole of the foot. The after-treatment is the same as that described above. The tendency to relapse of the deformity is a marked feature of these cases, whatever the treatment that has been adopted. *Robert Jones.*

(*Revised by H. A. T. Fairbank.*)

TALIPES, CONGENITAL.—It is well to remember that in most instances congenital talipes is a distortion pure and simple, unaccompanied by paralysis of any of the muscles, and capable of complete cure if treatment is commenced sufficiently early. Certain muscles are, however, abnormally short, while others are too long; the shortened muscles are stronger than the opposing and stretched ones, which tend to become still weaker from disuse and over-stretching, if the deformity is left untreated. Certain ligaments and bands of fascia are too short, but are capable of being stretched or divided. The bones are more or less deformed, but these will gradually acquire their normal shape if the deformity is corrected and the foot retained in its corrected position for a sufficient length of time. The earlier the case comes for treatment the more cartilaginous are the bones, the less distorted are they, and the sooner will they assume their normal shape.

There is no deformity which calls for a greater amount of patience and perseverance from both surgeon and parents than does the one under discussion.

Two points must never be forgotten: (1) Treatment must be commenced as early as possible; and (2) Treatment and supervision of the cases must be continued till all tendency to relapse has disappeared, i.e., in the majority of cases, for years. Many patients have to wear apparatus of some sort till they have reached the age of six or seven.

All varieties of this deformity are treated on the same general lines, and, since three-quarters of the cases fall under the head of equinovarus, this class of case may be taken as the type, and its treatment considered in detail. Equinovarus cases are usually more severe than those of other varieties; they possess a greater tendency to relapse, and they therefore call for most care in treatment. In this deformity, the foot is inverted and adducted, as well as plantar-flexed. The two former movements take place at the sub-astragaloid and midtarsal joints, the latter at the ankle-joint. The longitudinal arch of the foot is usually somewhat increased, and the plantar fascia contracted, particularly its inner part.

To obtain a complete cure the surgeon has to do three things:—

1. To correct, and to over-correct, the deformity.

2. To retain the foot in the over-corrected position till the muscles have regained their balance and the bones have acquired their normal shape.

3. To correct any accompanying deformity, such as rotation of the leg, genu valgum, &c., the presence of which may prejudice the result of the treatment of the foot. In all but the mildest cases of equinovarus there exists an internal rotation of the foot and leg. This rotation may take place anywhere in the leg, most commonly in the tibia and fibula. So long as this rotation persists, though the distortion of the foot be fully corrected, the child will walk with the toes turned in, and there will exist a constant tendency to recurrence of the varus portion of the deformity.

We may consider the treatment under four heads, arranged according to the severity of the cases to be dealt with. Thus we have (1) The mild cases, which can be cured without any operative procedure; (2) The severe cases, the most numerous, which require tenotomies, fasciotomies, etc.; (3) The relapsed and neglected cases; (4) The inveterate cases in adolescents and adults.

1. *Mild Cases.*—In these cases the foot can be brought into line with the leg, or even slightly everted, but the moment the foot is released it springs back to its faulty position. The equinus is also slight, i.e., dorsiflexion is but slightly limited. These cases may be treated successfully by manipulation and fixation on a simple tin shoe (*Fig.* 72). The mother or nurse is taught to manipulate the foot in two definite directions. For the first manipulation the heel and ankle are grasped firmly with the fingers and thumb of one hand, while the other grasps the forepart of the foot; the latter is then gently but firmly turned outwards, at the same time everted as far as possible, held in the corrected position for some moments, and then let go. This movement is repeated again and again, the utmost possible correction being obtained each time. The second manipulation is then performed as follows: the malleoli are grasped in one hand, while the other seizes the foot and dorsiflexes it as far as possible, holds it in the corrected position, and then lets go. This movement also is repeated many times. During this manipulation the foot must be held in the position of slight eversion, i.e., the varus must be corrected at the same time, or some of the muscles will escape proper stretching. The foot should thus be forced towards the position of calcaneovalgus. The foot and leg are then carefully massaged, special attention being paid to the muscles on the outer side of the leg. The splint is now applied to the leg with a calico bandage, the foot being held in as good a position as possible. Two or three times a day the splint is removed, and the manipulations and massage are repeated. Day by day the foot is further corrected, until full over-correction is obtained, but the treatment must be continued till all tendency for the foot to return to its faulty position has disappeared. The angle the foot-plate makes with the leg-piece can be altered from time to time as the over-correction becomes more and more complete.

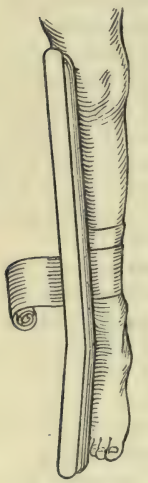


Fig. 70.
Malleable Iron Splint.

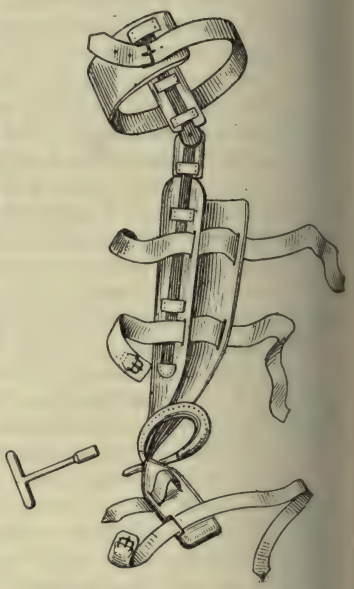


Fig. 71.—Adams's Varus Splint.

In the mildest cases the child may be completely cured before he learns to walk. In others the foot may still need watching after walking has commenced; in such cases it is well to manipulate the foot every night, and to let the child wear the splint during sleep, and to have the outer edge of the tread of the boot that is worn by day thickened by the addition of a slice or two of leather, while in a few cases a boot with the sole and heel thickened on the outer side, and with an inside iron and varus T-strap, may be required.

2. *Severe Cases.*—No hard-and-fast line can be drawn between mild and severe cases, but it will be found a good rule to make use of tenotomy in any case in which the foot cannot be brought into line with the leg by ordinary pressure with the fingers. The varus should be corrected first, the equinus left till later, as the tendo Achillis serves as a useful *point d'appui* for the stretching of the contracted tissues in the sole of the foot. During the first week or two of life simple manipulations may be employed; and in the third week, if the child is in good condition, tenotomy may be performed. What structures will require division? It is usually necessary to divide the tibialis anticus tendon, the inner band or the whole of the plantar fascia, and the anterior part of the internal lateral ligament of the ankle-joint. These may all be divided subcutaneously. The tibialis posticus may also require division, but this is by no means always necessary. This tendon is best divided above the internal malleolus, through an open incision. Occasionally it may be found necessary to divide this tendon after the equinus has been corrected. Other structures which may require division are the abductor hallucis, and the astragalo-scaphoid and the inferior calcaneo-scaphoid ligaments. As a rule all these structures can be

stretched sufficiently by forcible wrenching at the time of doing the other tenotomies, and by the daily manipulations afterwards. Some surgeons prefer to rely upon wrenching only, repeated on two or three occasions if necessary, rather than do tenotomies. In hospital practice it is wise to err on the side of doing tenotomy. After tenotomy a pad of gauze is placed over the puncture and a rather firm bandage applied ; the foot is then fixed in a partially corrected position (*Fig.* 70) by the iron splint, bent to a suitable angle round the outer side of the foot.* The foot should be held in as good a position as is possible without undue pressure. The usual position will be with the foot in line with the leg, a position which it could not before be made to assume ; to hold the foot in this position the splint must be slightly bent outwards. It is not wise to attempt full over-correction at once, as if this be done the pressure of the splint is liable to damage the skin. After four days the splint is removed, bent further outwards, and reapplied, the correction of the deformity and the daily manipulations being continued till the varus is fully over-corrected and the contraction of the sole unfolded.

This will occupy some four weeks, after which the second stage of the treatment is proceeded with. The tendo Achillis is divided subcutaneously, and the foot is forcibly dorsiflexed to stretch the posterior ligament of the ankle-joint; the foot is then put up at a right angle, with the varus corrected, for four days, after which time the daily manipulations and massage may be recommenced. Two splints are in common use. The better is Adams's varus splint (*Fig.* 71), which is quite simple and yet absolutely controls the foot. The other is a tin shoe, with a quadrant and screw on one side (*Fig.* 72), so that the degree of flexion of the ankle may be altered. The author prefers that the sole-plate of both the above splints should be slightly everted, and should not lie in a transverse horizontal plane when the leg-piece is held vertical. The sole-plate of the tin shoe should have its inner margin convex and its outer concave. These modifications of the simple rectangular shoe will be found of great service in holding the foot in an *over*-corrected position. This latter instrument has the advantage of being cheap, and is suitable for all the milder cases and the youngest infants ; but for severe cases and older children Adams's apparatus is the better. Although more complicated, it can be removed, replaced, and even adjusted by the mother or nurse. It has also some control over the internal rotation of the leg. The strap passing over the front of the ankle is fixed first, so that the heel is well down. It is also useful to have the sole-plate extended while the apparatus is being applied, and to screw it up after the heel is fixed, especially in the early stages of treatment. The sole-plate is best set in a position of slight eversion as in the case of the tin shoe. The tin shoe is fixed to the limb by a strong calico bandage. Whatever apparatus is used, it is removed two or three times each day, and massage and manipulations are performed as before. This treatment is continued till the child is allowed to walk, i.e., till about the end of the second year, though the correction of the equinus takes only from four to six weeks. If the case proves obstinate or is allowed to relapse, the foot may need wrenching under anæsthesia. Lorenz's padded wedge will be found useful, or the hands may be aided by some form of wrench, e.g., Thomas's.



Fig. 72.—Tin Shoe with Quadrant, special pattern for equinovarus.

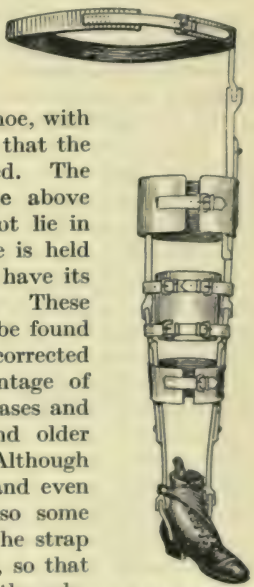


Fig. 73.—Walking Apparatus.

In most cases it is advisable to order a surgical boot and irons for walking purposes. A varus T-strap is always used. In the worst cases a light toe-elevating spring may be added, with a 'stop' to prevent over-dorsiflexion, while in the mild cases a ' back-stop ', to prevent plantar flexion, may be sufficient. In the majority of cases the inner iron should reach to the upper part of the thigh, while the outer iron is continued to a pelvic band, and double knee-caps and a ring-catch are added at the knee. By means of this large apparatus (*Fig.* 73), the internal rotation of the limb, wherever this may have taken place,

* This splint is *not* for equinus, but for varus.—*H. A. T. F.*

is controlled, and, as the child grows, gradually corrected. Laxity of the ligaments at the knee, genu valgum, and genu retrorsum, can all be dealt with by this apparatus. The irons should be worn for a year at least, and often for much longer. If difficulty is experienced in preventing the rotation inwards of the whole leg and irons, the pelvic band may be prevented from slipping round by the addition of a short iron reaching to a broad band around the thigh of the sound leg. When both legs are affected, the rotation of the feet can be easily adjusted by straps at the front and back of the pelvic band. At night a tin shoe or Adams's splint must be worn, the daily manipulations being carried out as before. The cause of relapse is leaving off treatment too early: the more severe the case the longer must it be watched. Something may be done for the rotation of the leg even before the child walks, if the twist occurs below the knee. The upper and lower ends of the tibia and fibula are seized by the two hands, and an attempt is made to twist the lower end outwards (Robert Jones). Osteotomy of the tibia is not uncommonly necessary in children —not infants—for correction of this inward rotation. The fibula does not require division. Adams's varus splint, if properly constructed, holds the leg and foot in a position of external rotation whenever the knee is bent.

3. *Relapsed and Neglected Cases.*—General rigidity of the foot is a feature of these cases, particularly of those that have relapsed. Only too often no bands of fascia stand out, inviting division by the tenotome. Some of these feet can be successfully treated by the methods already detailed. Forcible wrenching under anæsthesia will probably be necessary on more than one occasion. While plaster-of-Paris casings are not permissible in the youngest infants, in children of a year and upwards, where difficulty in retaining the foot in the over-corrected position is experienced, or the case has been neglected, plaster-of-Paris is of the greatest service. It has the advantage of holding the foot in a proper position continuously; but it prevents all exercises and massage, and should therefore not be employed for longer than two or three months. After the major operations when these are necessary, plaster should always be used. In spite of all we can do by these methods, some cases will still remain imperfectly corrected, chiefly owing to the deformity of the bones. Many operations have been devised for these cases, not one of which can be said to free the patient entirely from the possibility of a relapse. Phelps's operation which involves division of all the resisting structures on the inner side of the foot down to the bones, has not found much favour in this country, owing to the frequency with which it is followed by relapse, even when the wound has been covered by skin flaps or grafts.

Subcutaneous division of the chief resisting structures will form part of the treatment in all cases. Beyond this, three operations appear to offer the best prospect of restoring the foot to a fair shape without interfering unnecessarily with its functions. These are (*a*) partial astragalectomy, with removal of part of the cuboid, (*b*) complete astragalectomy and (*c*) Ogston's operation. Complete astragalectomy is called for in cases in which equinus forms the chief part of the remaining deformity. Ogston's operation is based on the fact that for the first few years of life each tarsal bone consists of a shell of cartilage surrounding a bony nucleus. The operation consists in incising the cartilaginous envelope and scooping out the contained bone. The foot is then forcibly corrected, the shells being crushed. It should be noted that in this operation the small joints of the foot are not interfered with. This operation should be limited to the cuboid, and not performed after the age of six or seven. Each case must be treated on its own merits, the major operations being more often resorted to in hospital than in private practice.

4. *Inveterate Cases.*—Of these little need be said in a work of this kind. The best we can hope for is a more or less unshapely foot on which the patient can walk with comfort. If time is no object, tenotomies and frequent wrenchings with the use of a Scarpa's shoe may give a successful result. In most cases one of the major operations will have to be undertaken. Of these there is a great variety, but only two need be mentioned, namely, astragalectomy and cuneiform osteotomy. In the latter a wedge with the base outwards, is removed from the tarsus, irrespective of the articulations. For a detailed account of the various methods which have been adopted in these difficult cases the reader is referred to works on orthopædics. It must always be remembered, however that, whatever operation is done, a relapse is possible, and must be guarded against by the use of retentive apparatus.

It should be remembered that in adults the adaptation of the bones and other tissues

to new lines of pressure and strain takes place far less readily than it does in childhood, and that a foot after correction may be the cause of even greater discomfort than was experienced before operation. In adults, therefore, amputation is a procedure which must be taken into consideration.

Of the other varieties of congenital talipes, the valgus, calcaneovalgus, and calcaneus cases are, as a rule, of a mild type, and rarely call for tenotomies. In these cases the tendency to relapse is small. Manipulations in the direction of inversion and plantar flexion, with or without the use of a malleable iron splint, will generally suffice to cure the deformity before the child is old enough to walk. In cases of pure valgus the peronei may require division, if the deformity is severe; and when the child begins to walk, a boot with an outside iron and valgus T-strap may be necessary. In mild cases combined with calcaneus, the valgus deformity is often overlooked till the child begins to walk. In such cases the whole of the inner edge of the sole and heel should be thickened so as to throw the ankle outwards. Massage and the use of the special shoes or boots should effect a cure in a year or so. Sometimes a valgus is sufficiently severe to call for the use of a tin shoe with the sole-plate inverted. Occasionally congenital valgus and varus are associated with partial or complete absence of the fibula or tibia respectively. The fibula is more commonly at fault, and in this case the valgus should be corrected, and a boot-iron and T-strap ordered for walking. The affected leg will be considerably shorter than the other. When the tibia is deficient the chance of obtaining a useful limb is extremely small.

H. A. T. Fairbank.

TAPE-WORM.—(*See* WORMS, INTESTINAL.)

TEETH, CARIES OF.

Dental caries is a bacterial destruction of the hard tissues of the tooth. It is pre-eminently a disease of young life, and makes most rapid progress in 'young' teeth; e.g., of two teeth, the first and second permanent molars, attacked about the age of 13, the second molar will be far more rapidly destroyed. It begins invariably on the exposed oral surface of the tooth, the sites of election being the pits and fissures of the crown, normal or abnormal, the interstitial surfaces of the teeth, and the buccocervical margins—any spot, in fact, where free cleansing is impracticable or not practised; hence caries at the necks of the teeth, by the gum-edge, is common in cases of prolonged illness, where careful cleansing of the teeth is a great difficulty. At some undisturbed spot acid-forming bacteria gain a lodgement. Starches and sugars, which undergo an acid fermentation, form their pabulum, and in a longer or shorter time the enamel at the spot is destroyed, dissolved by the acid products of bacterial activity, and a way is opened into the dentine. This, though calcified, is largely composed of organic matter. The acid-forming bacteria continue their work of destruction, decalcifying the dentine and attacking the enamel on its under surface; while other bacteria, whose activity is chiefly manifest by the production of liquefying enzymes, dissolve the decalcified dentine. The enamel, unsupported by dentine and thinned from inside, eventually gives way under the stress of mastication, and a large cavity is suddenly revealed. Since bacterial activity varies greatly with even the slightest changes of environment—for instance, the culture medium, the species of bacillus growing in association—many variants of dental caries are to be found, such as rapid, slow, pigmented, and arrested caries.

The minute differences between the saliva of health and of disease are probably enough to account for the absence or presence of dental caries, while the permanent absence of starch and sugar from the food would be an insuperable bar to its onset. (Meat and albumins undergo an alkaline fermentation.)

When the dentine is reached there may be pain, varying from discomfort to a severe neuralgia minor, but it is when the tooth pulp becomes involved that the most severe pain is felt. Inflammation of the pulp is set up either by the access of bacteria or their products along the dentinal canaliculi, or by exposure of the pulp in the course of extension of the carious process. Acute inflammation of the pulp is soon followed by its death, due to strangulation of blood-supply from pressure of inflammatory exudation, and by equally sudden cessation of pain.

The intensity of the inflammation and the period of time during which the pulp survives its onset are very variable—from an acute process ending suddenly in death of the pulp in two or three hours, to a chronic condition resulting in a polypus of the pulp, analogous to the 'hernia cerebri' of older authors—the differences depending on the intensity of the infection and the extent of exposure as leading to greater relief of pressure.

In general the dead pulp rapidly decomposes, and, via the apical foramen of the root, the bone becomes infected, leading to an 'alveolar' abscess.

Thus, in the course of dental caries 'tooth-ache' may be due to: (1) Lesion of dentine: (2) Inflammation of pulp; (3) Periodontitis and alveolar abscess. Usually the first of these conditions will cause only a moderate amount of pain and discomfort, but the symptoms vary from nil to a true neuralgia minor.

The distinction between the second and third may in general be made by consideration of the following points:—

Inflamed Pulp.—Pain intermittent, of a sharp, shooting character, often referred to other parts of the distribution of the fifth nerve, to the ear and down the neck in the case of lower premolars and molars; from a lower to an upper tooth, or vice versa, *of the same side*; made worse by changes of temperature, or by such chemical stimuli as sugar or salt. Tooth not tender on pressure; but if pressure is made on the exposed pulp a paroxysm of pain is set up.

Alveolar Abscess.—Pain constant, localized to site of lesion. Tooth very tender on pressure, and feels raised above its fellows, so that biting becomes impossible. Later there is swelling of soft parts, usually accompanied by relief of pain. As with an acute pulp-inflammation, pain may cease suddenly, the cessation being due to the relief of intra-osseous pressure sequent on perforation of the outer plate of bone by the pus. Hence the pain of a dental abscess usually becomes less as the swelling of soft parts increases.

Though an alveolar abscess is usually an acute abscess of bone, palpable central necrosis is almost unknown.

Palliative Treatment of 'Toothache':—

1. *Due to Lesion of Dentine.*—Clear the cavity of débris and try to cover in with guttapercha; failing this, insert frequently-renewed plugs of cotton-wool dipped in an alcoholic solution of gum-mastic, after applying oil of cloves to the cavity in each case.

2. *Due to an Inflamed Pulp.*—(*a*) If the pulp is not exposed, treat as in the first case. Relief is not certain, but may follow when peripheral irritation is prevented by an antiseptic plug. (*b*) When the pulp is exposed, syringe the cavity clean with warm water, insert gently over the pulp a pledget of cotton-wool soaked in oil of cloves, pure carbolic acid, or creasote, and over this a containing pad of cotton-wool soaked in an alcoholic solution of gum-mastic. The first pledget must be large enough to prevent the gum solution reaching the pulp, and the containing pad must be put in without making any pressure on the pulp. While pressure exists there can be no relief of pain. Before there is room to insert any plug it will generally be necessary to clear away some of the softened dentine.

3. *Due to Periodontitis and Dental Abscess.*—In the early stages and in mild cases, painting the gums with tincture of aconite and iodine may give relief. Dry the gum over the affected part and beyond, and the cheek—this prevents the spread of the reagent. Hold the cheek aside, and with a pledget of cotton-wool held in the conveying forceps, paint the gum with the 'aconite and iodine'. ℞ Lin. Aconit., Tinct. Iodi Fort., āā ʒj.

Extraction of the tooth is the quickest and surest way of cutting short periodontitis or a dental abscess. The source of infection is removed and exit given to pus. Swelling of soft parts is no bar to extraction.

If extraction has been delayed, a subperiosteal, subcutaneous, or glandular abscess may need evacuating, whether or no the tooth be removed. In opening a subperiosteal abscess, keep close to the bone. A subcutaneous abscess should be opened early from outside. The scar of an early incision will be scarcely visible. A glandular abscess must be suspected when the trouble has existed for several days; it is frequently masked by the general swelling of soft parts.

If the patient desires to save the tooth, after syringing out the cavity insert a light plug of cotton-wool steeped in 5 per cent solution of carbolic acid, in the hope that some may soak up the root canal and cut short the supply of infective material. Give opium if pain is severe, and release pus when detected.

In the case of a single-rooted tooth it may be possible to perforate the bone opposite the tooth-apex and so relieve tension, but with multi-rooted teeth this is seldom practicable.

In the absence of all else, frequently renewed, lightly inserted plugs of cotton-wool soaked in carbolic acid, oil of cloves, or creasote may be used in any of these forms of toothache; but when using these drugs, put in a small plug of the reagent first, and cover this with a simple cotton-wool plug to prevent burning the mouth.

A gum-mastic plug will be foul by the end of twenty-four hours; hence such temporary stoppings should be renewed every twelve hours.

Septic Socket.—After extraction of a tooth, severe pain may exist owing to the presence of septic osteitis. This may have been due to: (1) Infection by forceps; (2) Infection from the mouth at the time of operation—germs lying round the neck of the tooth may be carried up into the tissues by the forceps; (3) Persistence of osteitis already present; (4) Subsequent infection from a septic mouth, especially when local anæsthesia

has been obtained by means of a solution containing suprarenal extract. In the absence of bleeding, the aseptic (or antiseptic) blood-clot which normally fills the vacated socket is not formed, and infection from the mouth contents readily takes place.

To prevent infection, forceps must be boiled, the neck of the tooth well cleaned with an antiseptic just before extraction, and a septic tooth extracted early.

In many cases infection is to be expected, especially after difficult extraction of a lower third molar. When a socket becomes septic, the only treatment consists in thorough syringing at least twice daily. Between-whiles a light plug of cyanide or sal-alembroth gauze may be left in the socket. Care must be taken to syringe to the bottom of each separate socket. A small metal nozzle connected to a bulb syringe by two feet of light rubber tubing forms the best syringe. The nozzle is to be put down to the bottom of the socket and a slight to-and-fro motion given to it during syringing. In bad cases six weeks of syringing may be needed.

As a general rule, at all ages every tooth which cannot be rendered aseptic and painless should be extracted.

Prevention of Dental Caries.—Well-cleansed teeth cannot decay. Bacteria may be present, but their food supply is cut off. Both natural and artificial cleansing should be made use of. Natural cleansing is obtained by thorough mastication, during which the scouring action of food particles, tongue, and cheeks is supplemented by a free flow of saliva flushing the interdental spaces. Firm meat, hard farinaceous food, and such fruit as apples will best promote this natural cleansing; and it is worth remembering, as bearing on many cases of indigestion at all ages, that thorough mastication also means thorough insalivation, and that salivary digestion of starches goes on for a long time in the stomach in a well-made bolus.

Starches and sugars, which undergo an acid fermentation, are the foodstuffs which promote dental caries. They are injurious according to their tendency to cling to the teeth when moistened with saliva. Dry stale bread, or bread made of coarsely ground wheat, will be found to leave a far cleaner mouth than the white bread in ordinary use. Indeed, to this food-staple must be attributed the greatest share of the causation of dental caries.

Artificial Cleansing.—Brush the teeth, inside, outside, and on the coronal surfaces, with a small firm tooth-brush (child's size) night and morning, especially night, and pass waxed dental floss silk between the teeth. On the brush use soap, or a weakly acid or alkaline tooth-wash.* Use a tooth powder only occasionally, to remove any more adherent stains.

After cleaning the teeth at night, eat nothing more—especially not sweets and biscuits.

Wherever possible, skilled dental attention for children should be secured early. They should early be accustomed to having their teeth examined, and the confidence gained by a painless visit to the dentist is of great value.

Hæmorrhage after Tooth-extraction may be expected whenever from long-standing apsis the gums are chronically engorged. The blood-vessels have lost their tone and power of contraction, and oozing is to be expected for some hours. Should the amount of blood lost call for interference, a soft pad of antiseptic (sal alembroth or cyanide) gauze, wool, or lint, shaped so as to press on and overlap the bleeding part, on to which the patient bites with the jaws bound together, will always stop the hæmorrhage. Bleeding definitely from a socket may be arrested in the same way, or by approximating the edges of the gum by cross stitches of horsehair or silk, which form a network entangling the blood and inducing clotting. There is no need to plug a socket, or to use astringents. In some cases a broken edge of alveolus or tooth frets the part with each movement of the tongue or cheek and keeps up hæmorrhage.

Joseph Geo. Turner.

TENDONS, INJURIES OF.—We must here consider: (1) *Section;* (2) *Rupture;* (3) *Dislocation.*

1. **Section.**—We must emphasize the fact that the division of a tendon need not lead to any deformity, and the test for division is that the movement normally carried

* The use of weak acids daily will in no way damage the teeth. Both weak acids and weak alkalis are solvents of mucus, but the acids are the more potent removers of 'dirt'.

out by that tendon and its muscle is now impossible. The most common site of division is in the region of the wrist-joint or fingers ; the amount of separation between the ends, due to the retraction of the upper end by the muscular belly, is greater in the region of the wrist than in the fingers.

The treatment may be considered under the following heads :—

a. Full asepsis must be used in the repair. Tendon being a tissue of low vitality, it is unwise to use strong antiseptics. The wound may be cleaned with turpentine and 1–80 carbolic ; but it is safer simply to paint the finger and swab the wound with a 2 per cent solution of iodine in rectified spirit. A carbolic compress must never be applied to a finger.

b. Immediate repair must be undertaken. There is no advantage, to my mind, in treatment by saline baths for three days, and then secondary suture of the tendon.

c. Signs of division of nerves must be thoroughly looked for before administering an anæsthetic to the patient.

d. To find the two ends. The operator may be fortunate enough to see these in the wound, but usually they have retracted. The upper end may sometimes be squeezed down by manipulation of the forearm through the sterile towel. Another plan is to stretch a tendon on each side—e.g., if the flexor of the ring finger be cut, then hyperextension of the middle and little fingers may cause the upper end of the divided tendon to come along its sheath into the wound. Failing this, the forearm may be bandaged firmly from above downwards by a sterile bandage. As a last resort, the incision may be extended along the line of the tendon till the upper end be secured.

e. In suturing, chromic gut is preferable to silk. In suturing small tendons, it is wise to place a ligature tightly upon the cut ends, and then with a round needle insert the chromic gut sutures close to these ligatures but distal from the side of the section. The object of the ligatures is to prevent the chromic gut sutures splitting the tendon as they are tied.

f. Cargile-membrane, if at hand, may be used to wrap round the sutured segment. It is infinitely easier, when working with Cargile-membrane, to work with dry hands and dry instruments. Whether membrane be used or not, the sheath should be closed as completely as possible with catgut.

g. A splint must be applied to relieve tension upon the sutured tendons.

h. Movement and massage. In the after-treatment, we have to regulate the length of the tendon and prevent adhesions. Tendon unites by fibrous tissue, which is very strong by the end of a couple of months ; therefore shortening of the tendon must be prevented in the early stages of the after-treatment. The surgeon himself should test the finger on the sixth or seventh day, giving very slight passive movement. If the bond of union seems firm, the passive movements are very slightly increased each day until, by the end of the fifth or sixth week, full movement is carried out. If at any time the bond of union seems weak, it must be allowed complete rest for four or five days. The splint may be removed at the end of the third week. Massage is commenced as soon as the stitches are removed and the wound is healed. Active movement is allowed when the splint is removed.

I have never been able to trace any benefit from fibrolysin during the after-treatment.

i. If the proximal end cannot be found, our only resort is to anastomose the distal end to a neighbouring tendon. If the section be old, and it is impossible to bring down the proximal end into apposition with the distal, a Z-shaped lengthening of the proximal part of the tendon may be carried out ; better still, the gap may be bridged by silk prepared by Lange's method.

2. **Rupture.**—The term explains itself. It may be divided into (*a*) Disinsertion, a sub-variety of rupture in which a tendon is torn from its insertion into the periosteum, and (*b*) Actual rupture. Rupture of the tendon, in my experience, is not so common as disinsertion.

a. Disinsertion.—This is seen most frequently in connection with the extensor tendons of the fingers or thumb, giving rise to the condition known as 'mallet finger' or dropped-phalangette. The so-called rupture of the ligamentum patellæ is, in the majority of cases, really a disinsertion.

Dropped-phalangette is seen in men and women. In men it is due (e.g.) to a blow

from a cricket ball on the tip of the finger catching the patient unawares and suddenly flexing the finger. In women it is due (e.g.) to forcing a tight stocking over the heel with the tips of the fingers.

In treatment, the mental picture we must have should not be, as a matter of fact, a complete tearing of all the tendinous fibres, but rather a condition comparable to the appearance of a portion of thick cloth which has been overstretched—i.e., a few fibres torn, the rest merely separated. There are two methods of treatment :—

i. The majority of cases get better by keeping the extensor tendon completely relaxed by the application of a splint which maintains the terminal phalanx in hyperextension. This must be persevered with for at least six weeks, and must be used even although the deformity is of some months' standing. The splint must be applied continuously ; and if removed for washing or massage, the terminal joint must not be allowed to flex.

ii. Should splint treatment fail, the alternative is repair by suture. The peripheral stump is never long enough in a true mallet finger to afford a hold for stitches. It is difficult to sew the proximal stump to the periosteum of the terminal phalanx. The best plan is to suture the tendon to the thick subcutaneous tissue in the region of the nail bed, the patient being warned beforehand that a temporary interference with the nail growth may be a sequel of the operation.

The after-treatment is essentially the same as that of a cut tendon.

b. Actual rupture.—The commonest sites for this are :—

i. The quadriceps tendon above the patella. I have seen only one case, and this was followed in twelve months by a similar lesion on the opposite side. Complete restoration of function followed the application of a splint to keep the knee extended, and massage. Should it happen in a young man, I should advise primary suture if the retraction of the quadriceps were marked. In the case I saw, judging from the repeated effusion into the knee-joint, the synovial membrane must have been torn with the tendon.

ii. Rupture of the tendo Achillis. Diagnosis from the separation of the ends should be easy, and I should advise primary suture ; but I have never seen a case.

iii. Rupture of the long tendon of the biceps is, in my experience, the commonest variety of ruptured tendon. It is nearly always bilateral. To my mind the lesions are pathognomonic of bilateral osteo-arthritis of the shoulder. The ruptured tendon usually becomes fixed secondarily in the bicipital groove, and I should refuse to open an osteo-arthritic shoulder for the sake of secondary suture of the ruptured tendon.

iv. The patellar ligament tears away from either the tibia or the patella. If near the tibia, the synovial membrane of the knee is intact. If near the patella, the synovial membrane is torn and the knee-joint full of blood. The treatment depends upon the amount of separation. This, again, depends upon the extent of the tear laterally. If the separation be slight, then good results are said to follow relaxation upon a splint ; while if the separation be marked, I should advise suture.

v. Rupture of the plantaris tendon is described as the cause of sudden very acute pain occasionally taking an athlete in the calf of the leg. Two points may be noted : first, there is more bruising than is usually associated with a ruptured tendon ; and, second, the condition has been known to recur in the same leg. So far as I know the rupture has never been accurately demonstrated ; an alternative explanation, that the sudden pain is due to the rupture of a small vein, is equally feasible, and strongly suggested by the two points mentioned. Treatment is relaxation and immobilization.

3. **Dislocation.**—The only dislocation of tendons at all common is that of the peroneal tendons from behind the external malleolus. The only other dislocated tendons I have seen were two cases of dislocated extensor tendon of the index finger. Dislocation of the peroneal tendons is not at all rare in cases of paralytic calcaneovalgus, but I have seen it once in apparently a perfectly developed foot.

In the paralytic, the slipping of the tendon is painless. It is easily seen on dorsiflexing and everting the foot, and the treatment is the treatment of the calcaneovalgus—viz., keep the foot inverted, and prevent the heel dropping, by a walking instrument double to the knee, a valgus T-strap, and a toe-depressing spring.

In traumatic cases, the symptoms are pain, swelling, and bruising in the region of the external malleolus, and the tendons are palpable. For treatment, the tendons must be replaced by extension and inversion of the foot, redislocation prevented by the application

of a pad and strapping, and the foot put in a plaster splint for three weeks. The tendency to redislocation is marked; therefore, on removal of the plaster case, it is wise to fit an outside iron to the knee, with a valgus T-strap, for two or three months. Should the condition become chronic, the tendons being repeatedly dislocated, they must be fixed in place by first of all deepening the bony groove, and then turning a flap of periosteum with spicules of bone from the outer surface of the fibula and suturing it to the periosteum of the os calcis. *Robert Milne.*

TENDONS AND TENDON-SHEATHS, INFLAMMATION OF.—So far as we can tell, inflammation is never limited to the tendon itself. Either (1) Areolar tissue surrounding it is involved—a condition of *tenocellulitis*; or (2) The synovial sheath is involved—a condition of *tenosynovitis*.

1. **Tenocellulitis.**— This occurs in the tendo Achillis. It follows excessive use, but is not due to rubbing by the upper part of the shoe, being above this level. Clinically, there is pain above and behind the heel, and the patient may have discovered that a high heel gives relief. The tendon may be swollen and tender, and on moving the ankle-joint slight friction may be palpable over the tendon. The condition is not common, and it has been confused with inflammation of the bursa between the tendo Achillis and the os calcis, in spite of the fact that the swelling and tenderness are above this level.

Treatment.—This consists in firm pressure; a piece of strapping starts just behind the toes, and passes over the heel and up the calf, with the ankle in a position of slight plantar flexion. It is fixed in position by a firm bandage, and the patient rests the foot as much as possible. Potassium iodide should be given, 5 gr. three times a day.

2. **Tenosynovitis.**—This is of two kinds—traumatic and infective.

Traumatic tenosynovitis may be of three types: Plastic; accompanied by serous effusion; or proliferating.

Infective tenosynovitis may also be of three types: Accompanied by serous effusion; suppurative; or tuberculous.

We have thus to consider the following forms: (i) Plastic; (ii) Accompanied by serous effusion; (iii) Proliferating; (iv) Suppurative; (v) Tuberculous.

i. *Plastic.*—This most frequently occurs in connection with the extensors of the thumb, more rarely in the extensors of the fingers. The onset is usually sudden, and the disease is seen after a bout of hard work in a person of a rheumatic tendency.

Treatment.—The limb should be fixed by a splint for at least two weeks. For the first week it may be painted with weak tincture of iodine every second day, and firm pressure applied by bandaging over wool. During the second week massage should take the place of counter-irritation. Occupation can be resumed gradually after the end of the third week.

ii. *Accompanied by Serous Effusion.*—This may follow a plastic tenosynovitis, or it may be infective, due to gonorrhœa, secondary syphilis, or rheumatism.

Treatment.—Having excluded tubercle in a chronic case, the treatment consists of rest on a suitable splint, counter-irritation, pressure, and massage.

iii. *Proliferating (simple ganglion).*—

Treatment.—The best treatment is complete excision, but it must be complete. Alternative treatment is to try the effect of rest and counter-irritation in the form of a blister. Ganglia are sometimes ruptured subcutaneously, either accidentally or intentionally by the surgeon or patient; the material escapes from the interior of the cyst into the subcutaneous tissue, and may often take from seven to ten days to be absorbed, remaining underneath the skin and moving from place to place like a lump of jelly. If the ganglion be very thick-walled, subcutaneous rupture may be assisted by a puncture with a tenotomy knife; but all these methods are uncertain compared with excision.

It may be noted that cysts comparable to ganglia have been seen in the substance of a tendon, and not infrequently in connection with the external semilunar cartilage. (*See also* Ganglion.)

iv. *Suppurative.*—This may be due to a punctured wound, spread of infection from a subcutaneous whitlow, or infection by the blood-stream.

The great danger is sloughing of the tendon. The explanation of this is that the tendon receives its blood-supply mainly by the vincula, which correspond to the mesentery

of the small gut. The rise of intrathecal pressure due to the formation of pus cuts off the blood-supply, and coupled with the action of the toxins in the pus, leads to the death of the tendon.

Treatment.—The essential treatment, therefore, is to relieve tension at once. This is best done by multiple small incisions, either on the palmar aspect or at the sides of the finger. To incise the sheath from end to end certainly relieves tension, but it allows the escape of the tendon from its sheath, and this is rapidly filled up by granulation tissue, rendering replacement impossible and leading to a useless finger. Having made multiple small incisions and relieved tension, the finger must be kept either in a continuous hot saline bath, or a Bier's bandage must be applied around the upper arm. The bandage is worn for twenty hours out of the twenty-four, and if it causes pain, either the tension in the sheath has not been relieved or the bandage is too tight. In the case of the thumb or little finger, if there is any tenderness above the annular ligament of the wrist, an incision must be made directly over the spot of maximum tenderness, avoiding the median and ulnar nerves. Incisions in the palm of the hand must be below the level of the outstretched thumb. If above this level, the deep palmar arch may easily be injured, and the upper ends of the synovial sheaths of the index, middle, and ring fingers will be missed. Pus in the upper part of the palm must always be evacuated by Hilton's method. As soon as the condition of the wound permits, passive movement and massage of the finger must be commenced. If the tendon becomes adherent it must be freed, and an attempt made to prevent the re-formation of adhesions by Cargile-membrane, early movement, and massage. If the tendon sloughs, an attempt may be made to replace it by strands of silk prepared by the method advocated by Lange. Amputation may be necessary for septicæmia, for prolonged suppuration, or for a useless or stiff finger which incommodes the patient.

v. *Tuberculous* (*compound ganglion*).—There are two forms: (1) Associated with melon-seed bodies; (2) Associated with excess of granulation tissue.

Treatment.—

1. Melon-seed body type.—Systemic treatment for tubercle—viz., open air, sunshine, and cod-liver oil. I have no experience with tuberculin in these cases. If the typical crepitation has been obtained, open the sheath above and below any constriction, remove or wash out with saline the melon-seed bodies, sew up the sheath, and keep the part at rest for six months after the operation.

2. Fungating type.—General treatment as above. Counter-irritation with Scott's dressing, and fixation in plaster-of-Paris for twelve months. If, in spite of fixation, pain continues, the plaster must be removed. If the swelling has increased, then operative treatment is indicated. The whole of the wall must be removed, and the part lying under the annular ligament must be treated by passing a strand of gauze from the opening above to the opening below and thoroughly wiping out all traces of granulation tissue. Any granulations on the tendons themselves must be removed by scraping. The condition is more serious than the melon-seed body type. *Robert Milne.*

TESTICLE, IMPERFECTLY DESCENDED, AND ECTOPIA TESTIS.—The imperfectly descended testicle usually has a good deal of mobility, so that, although the descent may be arrested anywhere between the abdomen and the upper part of the scrotum, its position generally varies from time to time. In ectopia testis the organ has traversed the inguinal canal, but instead of reaching the scrotum is found in some abnormal position. Thus, it may be displaced outwards towards the anterior superior spine or into Scarpa's triangle; or inwards in front of the body of the pubis; or it may pass beyond the scrotum to the perineum. The deformity may be unilateral or bilateral; the latter is by far the more serious, on account of the probability of sterility, since the spermatogenic function of the imperfectly descended organ is usually absent; the internal secretion is, however, generally, but not always, normally produced.

The treatment, both of ectopia and imperfect descent, is essentially operative; massage and traction are useless, and no form of truss is of any use for correcting the position of the testicle, though, in a few cases where operation for any reason is contraindicated, one may be required for the support of a co-existing hernia.

An imperfectly descended testicle requires to be treated on account of the risk of

the following complications: (*a*) The probable presence of a hernia or hernial sac; (*b*) Recurrent attacks of orchitis, often the result of slight injuries; (*c*) Torsion of the cord and gangrene; (*d*) Malignant disease.

The possible methods of treatment are: (1) Orchidopexy, or transplantation of the testicle to the scrotum; (2) Castration; (3) Replacing the testicle within the abdomen.

1. Orchidopexy.—This is the most desirable method of treatment; it is applicable both for ectopia and for imperfect descent where the testis can be felt to enter the inguinal canal, and is best performed between the ages of six and twelve years.

It is usually advised that, after the hernial sac which is practically always present has been removed, the testicle should be freed by division of the gubernaculum and any fascial bands, care being taken to avoid injury to the vas and vessels, and then brought down to a bed which is prepared for it in the scrotum, and fixed there by sutures. The results, however, are not satisfactory, atrophy occurring in a good many cases, and the testicle showing a strong tendency to retract to its original position. A more satisfactory method is to transplant the misplaced organ through the septum to the opposite side of the scrotum. Retraction to its usual position is prevented by the resistance of the septum, and, as no sutures are passed through the testicle, inflammation and further atrophy of that organ are unlikely.

In the event of the deformity being bilateral, it is best to operate upon one side, and to see the patient again after an interval of six months. If the result is satisfactory, the same operation may be performed upon the opposite side.

2. Castration.—This is especially indicated in cases of torsion or gangrene, or where the testicle is the site of a malignant growth. It is also called for in unilateral cases where the testicle is atrophied, and may be necessary where orchidopexy, owing to some anatomical condition such as shortness of the vas, is impossible or has failed.

3. Abdominal Replacement.—This is not often called for. When the testicle cannot be manipulated down into the inguinal canal, it should be allowed to remain in the abdomen. It may be necessary in bilateral cases where orchidopexy has failed upon one side, or when the testicles are atrophied, or transplantation to the scrotum is impracticable.

Philip Turner.

TETANUS.—The treatment of this disease falls naturally under two headings: (1) *Prophylactic*, certain measures that should be taken in all cases of wounds that have been contaminated with soil or manure, especially crushes and compound fractures; (2) *Systematic*, the actual treatment required when symptoms of the disease have made their appearance.

1. **Prophylactic Treatment.**—Modern bacteriology has shown us that not only is an incubation period usual before the development of symptoms after infection of a wound, but that this period is the most favourable for the employment of that valuable remedy, antitoxin, in those cases where, from the nature of the accident, there is a possibility of tetanus supervening.

Although we now know that tetanus can develop without actual suppuration in the damaged area, nevertheless crushed limbs where suppuration is profuse are specially liable to this dangerous complication.

Apart, therefore, from the ordinary measures that would be undertaken for the cleansing of any contused or lacerated lesion, such as washing, irrigation, removal of foreign bodies and of dead or dying tissue, and the provision of adequate drainage, it may be urged that in all cases where soil, cinders, refuse, etc., have obtained access to a wound, protective or immunizing doses of antitoxic serum should be given. Although tetanus is one of the few organisms for which we possess a specific antitoxic serum, this serum is not particularly potent or satisfactory when once symptoms of the disease are manifest; and granting that, under the above conditions, the serum will be administered unnecessarily in a certain number of cases, the nocuous effects are not serious, and such treatment will undoubtedly lead to the saving of life and to the successful control of severe types of the disease. The mode of administration and action of the serum will be considered later.

2. **General Systematic Treatment.**—When once the appearance of typical symptoms has placed the diagnosis beyond doubt, the patient should be moved to a quiet room,

or surrounded by screens, and be protected as far as possible from sudden noises. Rest and quiet are very important factors in dealing successfully with these cases. The banging of a door or the falling of a tray will often bring on a painful convulsion which might have been avoided.

In tetanus, as in strychnine poisoning, the nerves and nervous system generally are hypersensitive, and every effort should be made to avoid sudden or violent stimulation of the senses. The blinds should be drawn, or curtains hung so that the bed is in the shade, and no gas or other light should shine on the patient.

As the result of the violent contraction of the muscles, profuse sweating occurs, and it is advisable to bear this in mind, since the bed linen must be changed frequently.

Diet.—Milk and fluids generally will be found most suitable. In mild cases the patient may be fed through the mouth—a tooth if necessary being extracted, though in cases of moderate severity this is often not required. Where the spasms are severe, nasal or rectal feeding will be called for, and in the worst types of cases the disturbance created by attempts to pass the nasal tube is so great that the operation must be performed under chloroform anæsthesia. In all instances the greatest care must be exercised in this matter of feeding, since the spasm of the constrictor muscles greatly interferes with swallowing, and the patient often shows a tendency to choke if the food is given too quickly.

The Wound must be treated on ordinary antiseptic principles. Free incisions should be made for drainage, and antiseptic lotions and dressings applied. When once the symptoms have appeared, the local treatment of the wound seems to have little influence on the course of the disease. Amputation for tetanus is not called for as far as the tetanus itself is concerned, though it may be necessary for other reasons. It has been shown that during their period of incubation the tetanus bacilli produce the toxins in the wound, and that these toxins are rapidly taken up into the nervous system, where they combine with the nerve-cells. Afterwards the bacilli die ; they do not remain and manufacture fresh poison. This being the case, it is necessary to deal with the wound on ordinary principles only, cleansing thoroughly and swabbing with strong antiseptics.

Micturition and Defæcation.—Owing to the spasm of the muscles of the perineum, a catheter may be required, and some trouble will be experienced in obtaining satisfactory actions of the bowels.

Medicinal Treatment.—Nearly every drug that can exercise a sedative action on the nervous system has, from time to time, been vaunted as a valuable remedy in cases of tetanus. Calabar bean, curare, hyoscine, and others of the belladonna group, have been employed. On the whole, chloroform and chloral combined with bromide of potassium have given the best results.

Chloral, since it diminishes the activity of the anterior nerve-cells and diminishes the conductivity of the nerve-fibres, is most valuable. It is, however, a poison, and a powerful cardiac depressant, and therefore must be used with care. In the case of a strong adult, chloral 25 gr., bromide of potassium 30 gr., should be given per rectum as soon as possible, and this should be followed by 15 gr. of each drug every four hours. There is no doubt that this combination affords the greatest possible relief to the unfortunate sufferer. Chloroform should be reserved for those very severe cases where the spasms threaten the patient's life by asphyxia, or where the chloral and bromide do not control the convulsions.

It has recently been suggested as an alternative to the above treatment that anæsthesia of the spinal cord should be induced by the injection of cocaine into the spinal canal. In severe cases this might be given a trial, but there are not sufficient data to hand to allow of our pronouncing definitely upon the method at present.

Antitoxin Treatment.—When the specific toxin and its neutralizing antitoxin were isolated, great hopes were raised of curing all cases of tetanus by this serum. Unfortunately, insufficient knowledge of the mode of action of the toxin led to the employment of this remedy in an entirely empirical manner. Doses of varying amounts were given beneath the skin, injected into the subdural space, and even into the brain itself.

Recent investigation, especially the valuable work of Schmiedeberg, has cleared up many debated points in connection with the spread of the disease. During the latent period, or period of incubation, the toxin is slowly spreading, not along blood-vessels or

lymphatics, but along the axis cylinders of motor nerves, and the shorter the path and the more powerful the toxin, the sooner does it reach the cells in the spinal cord. From this situation it has been proved to spread both along the cord to the basal centres, and through it to the cells which influence reflex action and tonic contraction of the voluntary muscles.

Now the toxin of the tetanus bacillus has a specific selective action upon nerve tissue, and its union with it results in the formation of a relatively stable compound which it is difficult to analyze.

In these circumstances the antitoxin is almost powerless to cut short the effects which will necessarily be produced by the dose of toxin already received by the nervous system, and the series of events which result from this accident must run their course. On the other hand, antitoxin can neutralize any toxin that may be free in the nerve substance, sheath, or lymph spaces, and by such injections, clearly prophylactic, further affinity between nerve-cell and toxin may be prevented. With this knowledge before us, it becomes imperative to inject the antitoxin in those situations where the toxin will be most readily encountered, that is to say, along the motor nerves of the limb or into the arachnoid sheath of the spinal cord, and as the poison has to pass along this path before it can reach the general circulation, the administration of the antitoxin subcutaneously cannot be supported.

It has been suggested that a large dose of antitoxin injected subcutaneously or into the cerebral substance can, by exerting a 'mass effect', succeed in disintegrating the product of the toxin and nerve-cell; but so far there is little experimental proof of this assertion.

Many forms of antitoxin are supplied, the best being made by the Pasteur Institute in Paris, the amount of the injection made along the nerves or into the spinal theca varying from 10 to 100 c.c., according to the age of the patient, the severity of the disease, and the subsequent reaction.

On the whole, small doses, 10 c.c., repeated, are likely to be more satisfactory than a large single injection. All precautions must be taken to avoid sepsis.

Although, with standardized and carefully prepared serum, serious ill-results are unlikely to follow this treatment, certain complications occasionally attendant on the administration of the antitoxin must be mentioned; of these, rashes, urticaria, and painful effusion into the joints are sometimes encountered. Beyond simple symptomatic treatment they do not require further attention.

Treatment by Sulphate of Magnesia.—Doses of 3 to 6 c.c. of a 25 per cent solution of sulphate of magnesia have been injected into the subarachnoid space by lumbar puncture: the drug appears to possess considerable antispasmodic power. It must, however, be used early. The injections may be given every other day.

Bacelli's treatment of tetanus by the injection of carbolic acid (10 to 15 min. of a 2 per cent solution) is said to be very successful in Italy; from a limited experience the writer recommends the method. *W. H. Clayton-Greene.*

TETANY IN CHILDHOOD.—(*See also* Cramp.) Tetany, with its carpopedal contractions and irritability of peripheral nerves, is commonly seen in conjunction with laryngismus, convulsions, and rickets (q.v.). It is practically always due to gastro-intestinal affections, and is cured by treatment similar to that for other rachitic neuroses. Fatal cases are rare, but tetany arising in marasmic weakly infants is often fatal. The stomach or the colon is usually dilated in such cases, and regular lavage, together with carefully selected diet, affords the only chance of recovery. Food should consist of peptonized milk and barley-water, or albumin-water and whey. Citrate of soda, in doses of 1 to 2 gr. to the ounce of milk, may render it more capable of absorption. Rectal alimentation is often necessary.

Chronic tetany occurring in children upwards of two years of age is usually associated with dilatation of the colon, and is fatal as a rule, in spite of treatment by lavage, careful dieting, and intestinal antiseptics. The question of operative interference (cæcostomy or appendicostomy) should therefore be entertained. A more tractable form of tetany is sometimes seen in young girls at the time of puberty. It usually yields to treatment by purgation, tonics, and attention to general health.

Rickets is present in the majority of infants who suffer from tetany, convulsions, and laryngismus, and needs appropriate treatment. Tinned milk and patent foods should be discontinued, and pure cow's milk, unsterilized and unpasteurized, should be given if procurable. Suitable clothing should be worn night and day, but the child should not be over-clothed. Fresh air is essential. Coddling in close rooms should be discouraged.

Leonard G. Guthrie.

THERMOTHERAPY.—The applications of heat for therapeutic purposes are practically innumerable, ranging from the linseed or oatmeal poultice of old times to the more elegant electrical thermophores or radiant-heat applicators of the present day. We must differentiate between the forms of heat as follows: (I) *Moist heat*; (II) *Dry heat*; (III) *Luminous radiant heat*; and (IV) *Diathermy.*

I.—MOIST HEAT.

The oldest and most widely known form in which moist heat is applied is that of the fomentation or poultice. The material best suited to the purpose is naturally that which retains its heat longest. Linseed and flax meal, although generally used by the laity, and often by the medical profession, cannot be said to excel in this way, but they possess advantages in being readily obtainable and cheap. They are, however, messy, and cool easily. The split baked potato, formerly much in vogue in the treatment of tonsillitis, is a clean and effective way of applying heat to a small area.

When obtainable, one of the volcanic muds or clays, such as fango di Battaglia (there are many fangi to be had in Italy), is most efficacious, for this possesses the faculty of retaining heat for a remarkably long time, and is an application which affords much relief in painful conditions.

The use of kaolin and of diatomaceous earths for this purpose has emanated from America, and marks an improvement in technique.

One of the best-known preparations of this sort is *antiphlogistine.* It is a proprietary preparation and somewhat expensive, but is very effective in many simple inflammatory conditions, especially when these are restricted in area. It is a compound of fuller's earth, several essential oils, and glycerin. The effect of the glycerin is that, being highly hygroscopic, it abstracts considerable moisture from the inflamed tissues. To be effective, this compound must be applied as hot as the patient can bear it—generally 112° to 115° F.—in a layer about one-eighth to one-quarter of an inch thick. It is best heated by placing the tin container in a pot of boiling water, care being taken that the water does not boil over into the tin. The contents of the tin should be stirred occasionally while it is heating, to ensure the temperature of the whole being uniform. Before making the application, the operator should test the temperature of the paste on the back of his hand. After being applied, the layer should be covered with cotton-wool, and removed in about twelve hours. A convenient spatula for spreading the paste is supplied with each tin. The use of antiphlogistine is recommended in both pleurisy and pneumonia, and is certainly much to be preferred to the ordinary poultice, but it has the disadvantage that, to a large extent, it prevents the physician observing the progress of the disease by auscultatory examination.

Poultices are rarely used nowadays in lung conditions, particularly not in children, for they throw an extra burden on the already embarrassed respiratory muscles. For a poultice to be efficacious in general conditions, it must be applied very hot and in a thick layer, and after covering it up with some fabric, a useful accessory is a hot-water bottle of rubber, or an electric thermophore, to maintain the temperature.

Hot fomentations are usually made of several thicknesses of flannel or spongiopiline wrung out of boiling water.

A simple form of wringer is made by fixing a piece of strong huckaback towelling to two short pieces of stick—a piece of a broom handle does well. The dripping fomentation is placed in this, and the towelling closed over it and twisted until all superfluous water is removed. When properly done, this avoids all scalding of the operator's hands. As fomentations cool rapidly, they should not be removed from the towelling until they are actually applied to the patient, when they should be overlaid with a piece of waterproofed fabric, and changed frequently. The proper temperature may be estimated by pressing the back of the hand against the fomentation; merely brushing against it is of no use.

Vapour Baths.—While dealing with moist heat, the *Russian bath* must be mentioned, although it is not greatly in vogue at the present day. This is due to the fact that the patients are subjected to an intense heat in a very moist atmosphere, which renders it very oppressive to most of them, little or no relief being afforded by natural evaporation from the surface of the body. The patients inhale air highly impregnated with steam, and high temperatures become impossible.

Certain subjects, however, who possess a very dry skin, prefer such a bath to a dry atmosphere like that of the Turkish bath. Psoriasis and certain forms of eczema obtain marked benefit from the use of the Russian bath.

The Steam Box, *or Berthollet Bath,* is employed for the application of steam to any given part of the body—elbow, knee, foot, or hand. Berthollet's apparatus consists of a central cylindrical chamber, from which steam is supplied, fitted with cylindrical projections for the various limbs. These projections are adapted closely to the parts by means of leather or rubber cuffs. The affected limb is adjusted within its respective cylinder, and having been securely packed, is exposed to as high a temperature of moist heat as can be borne—about 120° to 125° F. The period of application is from twenty minutes to half an hour, or more in some cases. At the conclusion, the limb is carefully sponged over, and massage applied. It is a valuable method in the treatment of any chronic joint affection of a gouty or rheumatic nature. Perhaps the most relief is afforded in rheumatoid disease. The absorption of effusions in traumatic cases is much promoted.

II.—DRY HEAT.

The Turkish Bath.—Therapeutically, this ancient bath has somewhat waned in popularity, with the medical profession at any rate. The tendency in certain subjects to headache after a bath, the risk to apoplectic subjects, and the tendency to faintness and exhaustion in weakly people, have induced some caution in prescribing it, and in every way the electric-light bath, in which the head of the patient is in the cool atmosphere of the room, is much to be preferred. A Turkish bath also takes up much space and is of a very elaborate nature.

The Lamp Bath, such as the 'Century cabinet' and the like, while in a measure effective, is extremely risky. The lamp is easily overturned, and the material of which the baths are constructed is in no small degree inflammable.

The Electric-light Bath, in which we have phototherapy and thermotherapy combined, is a most valuable therapeutic agent which is being increasingly employed in this country. It is immeasurably superior to the unsafe and defective lamp baths so much advertised by certain firms, is very easily controlled, need not be expensive, and, owing to the increasing application of electric light as an illuminant, can be used in most modern houses. Many a severe chill has been checked and threatened pneumonia staved off by the timely use of one of these baths after undue exposure.

The bath is made in two types, the vertical and the horizontal, the latter being much the more comfortable. It is fitted with twenty to thirty incandescent lamps and a metal reflector. The patient sits or lies in the bath, stripped to the skin, the time of exposure varying according to the effect desired. Ten to twelve minutes will produce a tonic effect; for diaphoretic purposes an exposure of twenty-five to thirty-five minutes is necessary. The vertical form necessitates the patient sitting in a somewhat constrained upright position, which in certain subjects tends to faintness and sickness. The feet of the patient should be kept warm, and for this purpose most baths are fitted with an electrically heated footstool; failing this, the patient's feet should be in hot water.

The temperature of the bath varies from 65° to 150° C. The heat is largely radiant in character, and the temperature of the air in the bath is of very little moment. High temperatures are not bearable unless the air is absolutely dry. It is well, therefore, where exposure to a high range is wished for, to turn the lights on for fifteen to twenty minutes before the patient enters the bath.

Perspiration is more readily induced by this bath than by any other procedure. The body temperature rises rapidly—four to five degrees in twenty minutes. The increased elimination of CO_2 is very marked. The blood-pressure, after the primary rise, is lowered, and the number of red blood-cells increases about 15 per cent. By means of the prolonged dilatation of the skin capillaries, much blood is diverted to the surface of the body—to

the relief of any internal congestion; while the absorption of morbid exudates from pleural or other cavities is greatly promoted.

Therapeutic Indications.—Patients who have become 'seedy' and run down from overwork and absence of adequate exercise, who are suffering from a lethargic condition due to mal-assimilation of food, and whose muscles are loaded with fatigue products, experience a maximum benefit from this application two or three times weekly. Headaches, and the condition known in former days as 'uric-acid diathesis', are markedly relieved and benefited. Fatty glycosurics benefit, and the tendency to acid intoxication so common in glycosuria is greatly lessened.

In obese patients, a frequent and thorough application of this procedure is most beneficial, due care being taken to observe the effect on the circulation, as over-fat patients often experience faintness if the bath be prolonged or over-hot.

In renal disease, few applications or drugs afford such genuine relief as this bath, owing to the lessening of the kidney engorgement by the diversion of so much blood to the skin. Care is needed in prescribing it in cases of granular kidney, owing to the usually associated arteriosclerotic condition and tendency to apoplexy.

III.—LUMINOUS RADIANT HEAT.

The Dowsing Radiant-heat Apparatus is one of great value, and forms a distinct advance on the earlier forms of hot-air appliances. The heat can be thrown on any special part of the body, or the whole body be treated at once, according to requirements. By means of a rheostat contrivance, perfect control of the apparatus is ensured, and the temperature can be regulated with the utmost nicety up to 400° or 450° F. The apparatus requires no time to heat up, but immediately the current is turned on the rays of heat constituting the treatment are produced at any desired temperature. The difference from the ordinary dry heat of a fire is demonstrated by the fact that a plate-glass screen will shut off the latter, while it makes no difference to the radiant heat. The heating cylinders are suitably mounted on movable standards, with reflectors easily adjusted to any position. For general treatment an ordinary narrow bedstead is employed, with four standards and reflectors, the rheostat being fixed at the back of the bed. The air is of necessity dry, otherwise such high temperatures would be impossible for the patient. To prevent the sheets scorching or catching fire, they are soaked in tungstate of soda, and the cushions are as a rule covered with asbestos sheeting.

Duration.—The bath usually lasts from twenty to forty minutes, and it is wonderful how comfortably the high temperatures are borne by the average patient. Even when the part affected is merely a joint, or in a case of sciatica, the best results are obtained by exposing the whole of the patient's body, for the general sudorific effect is obtained as well as the local benefit of the rays.

Free perspiration usually occurs, and both pulse and respiration are quickened. Painful affections are for the most part relieved very soon after the application of the rays, even though the relief be at first merely temporary. It is not usual to douche down the patient after this treatment, but merely to give him a dry rub with a towel. The effect of the bath is often enhanced, however, by the after-application of massage. Some patients insist on a spray before dressing.

Care is needful in prescribing this bath for very feeble, debilitated patients, as they often perspire profusely from the first, and get into a state bordering on collapse.

Tyrnauer's Apparatus for Hot-air Treatment.—It is claimed for this apparatus that the air within the enclosure is even in temperature, which is often not the case in hot-air machines. In some of such apparatus there may be a difference of 100° between the parts, depending on their distance from the source of heating. In Tyrnauer's machine the air is heated by means of electrical resistance wires lying in a trough beneath the apparatus. A temperature of 170° to 200° F. can be attained in five or six minutes, and in ten minutes this can be raised to 300°. The temperature may be varied with the greatest ease at the operator's will.

The apparatus is made of oak or mahogany and metal, with a lining of white asbestos. There are three separate sources of heat, any one of which can be turned off or on, and the regulation of the temperature is further facilitated by the use of a perforated asbestos screen which may be raised or lowered to lessen the degree of radiation from the source

of heat. The resistance wires rest on an eternite (asbestos slate) tile or plate, and are regulated by switches connected with the electric supply by means of insulated cables. The risk of short circuit is carefully guarded against, as in the Dowsing apparatus, by means of double fuses. Each apparatus is supplied with a thermometer fixed in a prominent position, so that both the patient and bathman can read it. The amount of current consumed varies in the different apparatus from 5 to 18 ampères. An ordinary treatment costs twopence, on the average, in electric current supplied. The apparatus are both general and local, one for the whole body, one for the shoulder, or for the elbow, knee, arm, and so on. They are all well finished, durable, and very comfortably fitted to the patient, so that no fatigue is involved. In the apparatus for the knee, for instance, the whole joint is exposed to the hot air from both the anterior and posterior aspects, and not only from the anterior and lateral aspects, as in most apparatus of this nature. One drawback to these mechanisms is their expense.

The Harrogate Non-luminous Hot-air Bath.—This resembles the Dowsing in that the heat is obtained by the passage of the electric current through wire filaments, but its wires are composed of non-oxidizable metals or compounds of metals, and are naked. These wires, arranged somewhat like the strings of a harp, are wound upon porcelain insulators attached to the back of the generator, while the front or inner side is a perforated sheet of aluminium. A temperature of 200° to 250° F. is easily obtainable, and the raising or lowering of it is under absolute control. The current may be derived from the main or, if used where no electricity is laid on, from accumulators. The rays convected from the naked wires have heat-giving properties only, and, like the Dowsing, are devoid of violet or ultra-violet rays. There are separate apparatus for each limb and one for the whole trunk.

Radiant-heat baths are specially recommended in subacute and chronic rheumatic affections, in the various forms of arthritis, infective and otherwise, and also in gouty neuritis and sciatica. Relief is often afforded to toxæmic headaches. The counter-indications are aortic disease of the heart and myocardial degeneration. The usefulness of massage and movements to stiff joints is often enhanced by a preliminary exposure to the radiant heat, which seems to soften the adhesions and make them more yielding.

The Dowsing apparatus are let on hire, and not sold. Lists of depots throughout the country where the treatment is available, and particulars as to terms, may be obtained from the Dowsing Co., 24, Budge Row, E.C.

The Hot-air Douche.—This is a very clever and useful little device placed on the market by the Medical Supply Association Ltd., Gray's Inn Road, W.C. Constructed largely of aluminium, it weighs only about 3 lb. It requires a very light current, and can easily be worked off a wall plug. It consists primarily of a small fan, which, when in motion, creates a strong draught over a coil of fine nickel wire brought to a white heat by the same electricity which works the fan. The air is blown through a focus tube on to the part to be treated, and in a few minutes attains a very high temperature, so that the nozzle of the focus tube has to be kept at a distance of 12 to 15 inches from the body, to avoid burning the patient's skin : in any case a marked erythema is produced. It is valuable in the treatment of minor rheumatic affections such as myalgia in neuralgia, and in neuritis in the arm, hand, or foot.

Being inexpensive and very portable, it is especially deserving of the attention of practitioners, since the only requirement for its use is the presence of an electric current in the house. It can be carried in a small midwifery bag. The cost is about £3.

IV.—DIATHERMY.

Diathermy is a form of thermotherapy in which the thermal effects are produced in the depths of the tissues by means of electric energy. It is a thermotherapeutic procedure which differs entirely in several respects from any previously employed.

It is necessary to understand clearly that all the older methods of heat treatment local or general, such as the poultice, hot-air douche, and electric-light bath, are *exogenous* methods of heat production ; the subcutaneous tissues are heated by thermal conduction only after the skin has itself been warmed. Increased activity of the skin-circulation involving dilatation of the capillaries takes place, and heat is continuously carried off by the blood-current, with the result that all the circumstances combine to prevent the

penetration of the heat to the deeper parts. On the other hand, in diathermy the source of the contributory heat is *endogenous*. That is to say, the increase of heat is produced locally in the deeper tissues, and the actual amount depends on the ohmic resistance involved and the square of the current-intensity used.

The principle underlying the method is the translation of electric energy into heat by the opposition of resistance (the Joule effect). The current, to be effective and at the same time harmless, must be of the alternating type, as a constant current of sufficient strength to produce heat to any extent would cauterize the tissues; further, ordinary alternating currents would produce tetanic spasm of the parts treated; so that those we use have to be of a special type—similar to what we use in high-frequency treatment. The voltage, however, is not nearly so high as in that method, and the ampèrage is higher. While with high-frequency treatment the voltage commonly runs to 100,000, or even 1,000,000, and the ampèrage is infinitesimal—½ to 1 milliampère—in diathermy we use only 20,000 to 40,000 volts, but an ampèrage of 2 to 3 ampères.

The best apparatus introduced for this purpose is that of Dr. Nagelschmidt, of Berlin. It is rather an expensive one, and considerable care and attention to detail is required in using it. Unless the electrodes—which may be of metal guarded with flannel or washleather, or better, some form of clay—are very carefully laid against the patient's skin, sparking will occur, leading to a burn. Although the heat is developed, as has been mentioned, in the deeper layers of tissue, the patient only feels it in the skin. The sensation may continue for two hours or more after the application has ceased. A temperature of over 100° F. can be tolerated for only a short time—it becomes painful after that—but up to this, any temperature may be borne. Marked hyperæmia is induced, as with a Bier's bandage.

Duration and Dosage.—As regards these particulars in the treatment of different cases, judgement is of course needed on the part of the physician responsible, but Dr. Nagelschmidt has produced a special table which is of great help to beginners in this respect.

Indications.—Diathermy is extremely useful in treating gouty and rheumatic joint affections of a chronic nature, as well as sciatica and various forms of neuritis. Blood-pressure may also be reduced by means of it, and glandular actively stimulated.

The treatment is also applied for certain surgical conditions, in removing small malignant growths on the skin or mucous membrane. So used, it is a thermic method of inducing local coagulation necrosis, strictly limited, and directed and controlled by the operator. Where there is no secondary infection, some success has been attained. (*See also* ELECTROTHERAPEUTICS.)

T. D. Luke.

THORACENTESIS.—(*See* PLEURISY.)

THREAD-WORMS.—(*See* WORMS, INTESTINAL.)

THROMBOSIS, CEREBRAL.—(*See* APOPLEXY.)

THRUSH.—Care should be taken to ensure cleanliness of the teat and 'comforter'. The bowels should be opened with a dose of castor oil, and any indigestion corrected by a mixture of rhubarb and soda.

℞ Tincturæ Rhei	℥iij	Glycerini		℥iij
Sodii Bicarbonatis	gr. ij	Aquæ Menthæ Piperitæ	q.s. ad	℥j

For a child of one year or less, given thrice daily.

Locally, one of the following should be thoroughly applied with a soft camel's-hair brush several times a day:—

1. Glycerin of boracic acid or borax and honey.
2. A solution of salicylic acid (1–250).
3. A solution of sulphate of soda (1 drachm to 1 oz.).
4. Solution of sulphurous acid (B.P.) (1–6 of water).
5. Borax and chlorate of potash (10 gr. of each) in 1 oz. of water sweetened with a little glycerin.
6. Permanganate of potash (1–1000).

Robert Hutchison.

THYROIDITIS, ACUTE. — Acute inflammation of the thyroid gland is a rare condition, and as a rule occurs only as a complication of some general infective disease such as influenza. Acute strumitis, i.e., inflammation of a goitrous thyroid gland, is less uncommon, especially in districts where goitre is endemic.

During an acute thyroiditis the patient must be kept at rest in bed, and if there is much pain on movement of the head, it may be fixed by pillows. The diet should consist chiefly of milk as long as the temperature is raised, light solid diet being given as soon as the temperature becomes normal and the patient is free from pain on swallowing. During the acute stage, cold should be applied to the front of the neck by means of an ice-bag, an ice-poultice, or Leiter's tubes. If these measures fail to check the progress of the inflammation, and if there is much pain, belladonna fomentations should be applied instead, and may be renewed at intervals of three or four hours until relief is obtained. At the onset of the attack, it is advisable to give 5 gr. of calomel or blue pill at night, followed by a saline aperient in the morning. During the febrile stage, sodium salicylate in 10 to 15-gr. doses may be given every three or four hours, and in some cases 3 to 4 gr. of potassium iodide may be added to the mixture with advantage. If pain is excessive, small doses of opium or of Dover's powder may be given for its relief. If suppuration occurs, it is important to incise and drain the abscess as early as possible.

George R. Murray

TIC DOULOUREUX.—(*See* NERVES, PERIPHERAL ; NEURALGIA.)

TICS.—It is desirable to preface an account of the treatment of tic with some explanation of the term, as the word is still employed loosely for conditions which differ widely enough.

Every one is more or less familiar with so-called 'nervous movements', 'movements of the nerves', which are supposed to be perfectly harmless and scarcely worth therapeutical consideration. Not all these nervous movements are tics ; many are no more than tricks or mannerisms and, however distressing and persistent they may be, do not come within the scope of this article. We may best understand what is meant by a tic by taking Meige's definition in full :—

"A tic is a co-ordinated purposive act, provoked in the first instance by some external cause or by an idea : repetition leads to its becoming habitual, and finally to its involuntary reproduction without cause and for no purpose, at the same time as its form, intensity, and frequency are exaggerated : it thus assumes the characters of a convulsive movement, inopportune and excessive : its execution is often preceded by an irresistible impulse, its suppression associated with malaise. The effect of distraction or of volitional effort is to diminish its activity : in sleep it disappears. It occurs in predisposed individuals, who usually show other indications of mental instability."

With the aid of this definition we learn that tic is not synonymous with convulsion, although the fact that a tic is a normal movement *exaggerated* must not be lost sight of ; nor is it a spasm a term which is to be reserved for motor phenomena, the result of irritation in a reflex area, e.g. the spasmodic contraction of the orbicularis oculi when a speck of dust gets into the eye ; nor again is it a stereotyped act, by which is meant a *normal* movement repeated involuntarily only at certain times ; e.g., some people put out the tip of the tongue when they are writing. The important points to appreciate are that tic is of psychomotor origin ; that in every true tic there is a mental defect and a motor defect, the former consisting in impairment of volition ; that the movement is, so to speak, the disfigurement of a normal movement, repeated in season and out of season, but in it co-ordination and purpose can practically always be detected ; that tic is often preceded by a desire for its execution and succeeded by a feeling of satisfaction ; and that it is painless, and disappears in sleep.

Any part of the body may be affected. We may have tics of the eyes, nose, lips, tongue, neck, arms, hands, etc. We may have sniffing, sucking, licking, biting, blowing, whistling, coughing, grunting, nodding tics, etc. Tic may occur by itself : some people never develop more than one solitary tic ; or it may be multiple : one tic may co-exist with or follow on another. Gilles de la Tourette's disease is a disease of multiple convulsive tics, associated with echolalia and coprolalia, and is peculiarly rebellious to treatment. Tic often occurs along with some other disease. Tics are frequently seen in epileptics, in idiots, in individuals suffering from psychasthenia and obsessional insanity ; they are less commonly found in hysteria. On the other hand, the intellectual superiority of the *tiqueur* may be as prominent as his mental instability. Many figures celebrated in history had their tic.

The PROGNOSIS in a case of tic depends solely on the mental state of the patient. The intensity and tenacity of any tic are determined by the degree of volitional imperfection to which its subject has sunk. He who can will, can effect a cure, but left to himself the victim to tic cannot always escape from it.

Treatment.—*Medicinal.*—Most of the ordinary medicinal agents in vogue in nervous and mental diseases have at one time or other been applied to the cure of tic; most have proved equally inefficacious. Sedatives and hypnotics—among which the bromides, chloral, and the preparations of opium may in particular be specified—sometimes effect a transient improvement, but they cannot permanently modify the mental weakness which is at the root of the mischief. A combination of the bromides and valerian often seems to have some beneficial action. The inconstancy of the therapeutic results hitherto obtained must not be allowed to discourage us, for it is important to remember that success achieved by medicinal means may not always be attributable merely to suggestion.

General.—It is very desirable to pay particular attention to the patient's general health. Often some trivial exciting cause may be the origin of a series of tics, and its removal may effect a speedy cure. This is especially the case in children. Their clothing ought to be attended to; it must be easy and comfortable. As so many of the tics of children concern the head, face, or throat, the orifices ought to be examined, and the ears, eyes, nostrils, teeth, palate, pharynx, etc., scrutinized. Girls may develop head-nodding tics because the hats which their parents choose for them are conspicuous for their size and awkwardness. Imitation, more particularly at school, may cause the development of tics; hence the question of the patient's environment should be considered.

Once a tic has established itself, we may expect little help from the use of any form of instrument or apparatus to correct muscular insufficiency or hyperexcitability. Devices of this nature are to be deprecated. As Meige and Feindel truly say, "The patient is relieved of his infirmity only to become the slave of his instrument".

Treatment by Re-education.—Systematized mental discipline has shown itself to be the method *par excellence* for the treatment of tic, because it is a recognition of the relations between the motor phenomenon and the patient's mental state. The method is a combination of "immobilization of movements with movements of immobilization". The patient is directed to perform various exercises, some of which are intended to teach him how to preserve immobility, while the object of others is to replace an incorrect movement by a normal one. To begin with, he is required to remain absolutely motionless, as for a photograph, for one, two, three seconds—in fact, as long as he can without fatigue. This period is gradually increased on successive days, the patient being encouraged by being assured that he can and will remain immobile. Place him at the outset in the position in which his tic manifests itself least often, e.g., sitting, then subsequently modify his position, and in every case explain to him the objects of the treatment and elicit his intelligent co-operation. The performances should be gone through regularly several times a day, and always at the same hours. Though the method is simple, it must be taken seriously. It is an excellent plan to take the exercises in front of a looking-glass, whereby the patient is informed of the degree of immobility attained. Indifference on either the doctor's or the patient's part makes the treatment futile.

In addition, the patient is taught the discipline of movements, the idea being to make him perform slow, regular, and accurate movements to order, addressing himself to the muscles of the area in which the tic is localized. They must be very simple at first, and the exercises must be very short. To begin with they should take place under the personal direction of the physician. As a specimen of treatment for a facial tic, we may quote the subjoined programme from Meige and Feindel: "Every day, and three times a day, at the same hours—nine, one, and six—the patient is to look at himself for two minutes in a mirror, preserving absolute immobility the while; to read aloud for two minutes; to speak in front of the glass for two minutes; to walk backwards and forwards in front of the mirror for two minutes. During these exercises he will endeavour to keep his facial musculature under control. If the tic assert itself in the course of one of the exercises, he will recommence the latter, if necessary, twice; the third time he will leave it till the next séance."

In tics of the limbs, shoulders, hands, feet, innumerable movements will suggest themselves for practice.

The unanimity of opinion on the value of respiratory gymnastics in the treatment of stammering has led to their adoption in the treatment of tics in general. It is

undoubtedly the bestowal of the attention on the allotted task that has such a salutary effect. Thus, by way of discipline of movement, the patient stands supported against a wall, with shoulders braced back, and is instructed to take slow and deep inspirations, raising his arms the while, and letting them fall with expiration. The performance is repeated three times a day, for ten minutes at a time. Cruchet has found the following method of service: The patient lies on his back with his arms by his side and counts the numerals up to, say, sixty, taking deep breaths at regular intervals, and endeavouring to maintain absolute immobility. Then he proceeds to make similar long inspirations and expirations, elevating his arms synchronously with the former, and depressing them with the latter. The exercises may advantageously be repeated every three hours to begin with, then their duration may be increased and the intervals lengthened. Or he may stand with heels together and back against a wall, and recite aloud for three minutes. Respiratory drill often succeeds admirably.

As muscular exercise is a striking way of disciplining volition, mention must be made of a re-educational procedure of much practical value, viz., mirror drill. It is a matter of common observation that if anyone be asked to write synchronously with the two hands, the left hand will tend spontaneously to adopt the mirror form of writing in which the letters run from right to left. Mirror writing is the natural writing of the left hand. What is true of writing is no less true of other forms of motor activity. The simultaneous use of symmetrical muscles is easy, of asymmetrical muscles difficult. It is especially in motor disorders of functional origin that mirror movements prove useful, and the frequent unilaterality of these disorders readily allows of the institution of a re-educative mirror drill. Thus it is a good plan to set daily exercises in writing, drawing, painting, tracing, etc., and to insist on the patient's devoting both hands simultaneously to his task. It will be found advantageous to devise symmetrical movements for the fingers, then for the hands, the forearms, and so on, and to instruct him in each successively. In this way the simultaneous execution of a normal movement with right and left hand is facilitated, and the sound limb imposes regularity on the other. Whatever be the localization of the tic or tics, this is the technique to adopt. The patient's interest is stimulated, while his attention is riveted on his involuntary actions; so is his will disciplined.

The re-educational methods of respiratory and other exercises and of mirror drill are of great and proved value in the treatment of certain forms of *Torticollis*. In this term are included various conditions which differ widely in their pathogeny, and the methods we have mentioned are not applicable to all. We may have torticollis of neuralgic origin, the sequel to occipital neuralgia, and strictly comparable with the tic douloureux of facial neuralgia. With the disappearance of the pain the spasm vanishes. Torticollis may be an occupation neurosis, and should be treated accordingly. It may be paralytic in origin, analogous to the secondary spasm of facial palsy. It may be a true spasm, the result of peripheral irritation, and not at all likely to be benefited by the procedures we have mentioned. In a case of torticollis it is eminently desirable to ascertain its nature in order that the appropriate treatment may be adopted. There remains the condition known as mental torticollis, a true tic, which will be found on investigation to present the features of tic as they have been defined. It is in cases of mental torticollis that we most frequently meet with the efficacious antagonistic gesture. The patient is able by a mere touch, often on the wrong side of the neck, to inhibit a violent 'spasm' over which he pleads he has otherwise no control. In such cases treatment by re-education is often of great service. Thus: Stand or sit in front of a mirror, and endeavour to maintain an absolutely correct position of trunk and shoulders. Lift the arms vertically and turn the head, say, to the right, then depress the arms while the head remains as it is. Bend the body forward, and stretch the arms out till they touch the ground, the head meantime being rotated to the right. Then rise up again with the head in the same attitude. After two or three efforts it will be found that the head can be kept straight for a few seconds. Many other modifications of the method will suggest themselves in particular cases. (*See also* WRY NECK, *and* TORTICOLLIS.)

S. A. Kinnier Wilson.

TINNITUS.—(*See* EAR, AFFECTIONS OF.)

TOE-NAIL, INGROWING.—This may be treated in the following manner:—

1. In mild cases a small pledget of cotton-wool should be introduced beneath the nail so as to raise it from its bed, the end of the nail being cut square. The ingrowth results from the nail curling round and growing in on the delicate and sensitive papillæ. If this simple treatment be undertaken with care and patience, the condition can be rectified. If there is much pain and tenderness, the nail may be softened by painting it with 20 per cent solution of caustic soda, the whole toe being then wrapped up in a moist antiseptic dressing.

2. In more severe cases recourse may be had to a small metal lever introduced beneath the side of the nail, so as to raise it up gradually over the fleshy tissue of the toe. This method is rarely satisfactory.

3. If the patient is willing to undergo an operation, the method advised by Watson Cheyne should be adopted. It is infinitely superior to avulsion of the nail. Under anæsthesia, an incision is made along the nail fold right down to the matrix; in this way a flap is formed of the soft parts that lie alongside the ingrowing nail. Rather less than half the nail is then cut away, care being taken to see that the cut extends well down to the matrix, and that the nail-bed is thoroughly destroyed. If these precautions are not taken, the operation will be a failure. The flap is now readjusted so that the nail lies on a higher level than the soft parts, and it is secured with one or two sutures. This is a radical and very satisfactory method, and one which will completely cure the trouble.

W. H. Clayton-Greene.

TONGUE, AFFECTIONS OF THE.

Tongue-tie.—This condition is due to incomplete development of that part of the tuberculum impar which forms the projecting part of the tongue; often the process of development continues during infancy, and the 'tongue-tie' disappears. It is very rare for the condition to persist. For these reasons division of the frænum should only be undertaken after due consideration, and should never be done by a midwife or other unqualified person. When it is necessary to divide the frænum, two fingers of the left hand are placed under the tip of the tongue, one on each side of the frænum; a minute snip is then made in the tightened band near the inner surface of the jaw with a pair of scissors.

Careless or unskilful division of the frænum may lead to severe or even fatal hæmorrhage, to falling back of the tongue, causing tongue swallowing and suffocation, and to septic ulceration, which may lead to serious fixation of the tongue by scarring. If called to a case of hæmorrhage and threatened tongue swallowing, the surgeon should pass a silk ligature through the tip of the tongue, draw it forwards, and gently wipe out the mouth, clean the wound, and see if there is a definite bleeding vessel. If so, a ligature should be applied, great gentleness being observed, as the parts are friable and apt to tear. If there is a general oozing, the wound may be packed with antiseptic ribbon gauze, the end of which, together with the ligature in the tongue, may be fixed under the jaw with strapping or a bandage.

Wounds of the Tongue.—These are most often inflicted by the teeth, but are sometimes caused by a pipe-stem or other foreign body. As a rule hæmorrhage is not severe and requires no treatment, but in cases of hæmophilia, fatal bleeding has occurred. Epileptics have been found pulseless in the morning from severe hæmorrhage, due to biting the tongue during sleep.

Severe hæmorrhage from a wound of the tongue should be effectually dealt with as soon as possible. The ordinary surgical rule of exposing the bleeding vessels and securing both ends should be followed. This will be comparatively easy when the wound is in the anterior part of the tongue, but very difficult when it is far back. It will then be necessary to open the mouth with a gag, and hook the base of the tongue forward against the jaw by means of a finger introduced into the back of the mouth. In this way the bleeding may be stopped whilst the patient is being put under chloroform. The tongue is then drawn out by two stout threads passed through the tip of the tongue, and the wound carefully examined in a good light. Any bleeding vessel thus exposed should be ligatured; but if blood wells up from a deep punctured wound it may be necessary to enlarge it to bring the damaged vessel into view; it should be remembered that the

ranine arteries are very deeply placed. Venous hæmorrhage or general oozing may be arrested by deep sutures. If a foreign body is embedded in the wound, it should be sought for and removed, otherwise the bleeding will very likely recur. When the bleeding has been arrested, the sides of the wound may be brought into apposition by means of catgut sutures; these may be left to separate spontaneously.

Acute Glossitis is due to micro-organisms (staphylococci and streptococci) having gained access to the parenchyma of the tongue through some trivial abrasion of the mucous membrane. The onset of the disease is very rapid. The tongue swells up to two or three times its natural size in twenty-four hours; there is usually severe pain, salivation, and dysphagia, sometimes aphonia and dyspnœa.

The milder cases may be treated by a purge, leeches below the jaw, and sucking ice; but as a rule, when there is much swelling, two longitudinal incisions, half an inch deep, should be made on the dorsum of the tongue. This gives great and rapid relief; often the patient is well again in a few days.

Chronic Superficial Glossitis.—Under this head are included several conditions, such a smokers' patch, leucoplakia or leucoma, ichthyosis, the smooth tongue, etc. They are all well known, but imperfectly understood. They all have in common a chronic inflammatory condition of the mucous membrane of the tongue, leading to an increase of the stratified epithelial layers, and diminution or disappearance of the papillæ, so that smooth white patches are formed of various extent and thickness. The real cause of the inflammatory changes is unknown, although smoking, alcohol, highly spiced food, and infected teeth are often largely responsible.

The appearances in chronic superficial glossitis are so well known as to require no description here. It is, however, of great importance to recognize the fact that although the condition cannot be cured, it must be very carefully watched, as it is so often a precursor of cancer of the tongue. In some cases the epithelium in one part of the leucomatous patch becomes heaped up into a warty growth. Such warts are, if not cancerous from the first, certain to become malignant sooner or later. In other cases fissures occur, and sometimes one of them deepens, becomes indurated, and develops into an epitheliomatous ulcer.

It is therefore imperative that leucomatous tongues should be guarded from all the well-known causes of irritation. Smoking should, as a rule, be prohibited, although inveterate smokers may be allowed the occasional use of mild tobacco; chewing must be entirely stopped. Very hot, very cold, or highly spiced food must be avoided, and alcohol, if taken at all, must be well diluted. Carious stumps, rough teeth, ill-fitting dentures, etc., must receive proper dental treatment. Dyspeptic conditions should be attended to, and if the patient is gouty, rheumatic, or syphilitic, the appropriate drugs should be prescribed.

All local applications to the tongue must be unirritating; caustics, especially nitrate of silver, must be avoided entirely. Alkaline mouth-washes, such as bicarbonate of soda 10 gr. to the ounce, chlorate of potash 10 gr. to the ounce, are often useful and relieve the subjective symptoms. Sometimes ointments consisting of a basis of lanolin, containing drugs such as borax, morphia, cocaine, etc., may be of more service, as they are not washed away so soon as the liquid applications.

The common broad thin patch of leucoma is not suitable for removal by surgical means; but in the rare cases where there is a small thick patch, removal by knife or scissors, and closure of the wound by catgut stitches, may be advantageously done. Warts or indurated fissures or ulcers occurring on a leucomatous tongue should be regarded as young cancers and dealt with accordingly.

It is well to remember that most tongue affections are made worse by breathing through the mouth; great relief may result from attention to any nasal obstruction that may be present.

Ulcers.—The tongue is subject to ulceration from many causes, both local and constitutional.

Dyspeptic Ulcers usually occur on the tip of the tongue, and may extend backwards on the dorsum; the neighbouring portion of the tongue is often red, irritable, excoriated, or deeply furred. The treatment should be begun by giving an aperient. The bowels must be kept acting daily, and remedies such as bicarbonate of soda, rhubarb, and

gentian, given internally. The diet must be regulated, all food being soft and unirritating. A mouth-wash of chlorate of potash, sanitas, or listerine may be prescribed. If healing be slow or the ulcer painful, it may be painted with a 5 per cent solution of chromic acid.

Traumatic Ulcers occur on the tip or edges of the tongue, and are usually due to the continued rubbing of a rough or carious tooth or a badly-fitting denture. These 'dental' ulcers may vary in character. When the mouth bacteria take an active hold on the excoriated surface, the ulcer assumes an *acute* character; its surface is sloughy, its edges are sharp cut, and the surrounding area is swollen, sodden, and thickly furred. Removal of the offending tooth, a purge, and a suitable mouth-wash will soon bring about a cure. In other cases the ulcer is of a *chronic* character, and very little is to be seen on examination; it may be a mere crack or fissure opposite a rough tooth, or sometimes opposite a gap between two teeth. These chronic ulcers, if left untreated, are apt to become indurated and to develop into epithelioma. The treatment consists in removing or stopping carious teeth, rubbing down rough or prominent corners, or filling up gaps in the alveolar arch by proper dental methods. The ulcer may be painted with a 5 per cent solution of chromic acid. On no account should a chronic indurated ulcer be allowed to remain. If it does not quickly yield to treatment it should be excised and the wound sewn up with catgut. It is always well to examine microscopically the portion removed.

Syphilitic Ulcers may affect the tongue in all three stages of the disease. Primary chancres of the tongue are rare. They occur on the tip or anterior part of the dorsum. They are apt to be overlooked or mistaken unless one adopts the very useful rule of suspecting that any sore of peculiar appearance which defies diagnosis may be a primary sore; the diagnosis can then be easily confirmed by the co-existence or subsequent appearance of signs of secondary syphilis.

In secondary syphilis the most important lesions are the mucous tubercles or plaques and the ulcers to which they give rise. On the dorsum and under surface of the tongue mucous patches remain smooth or may acquire a warty appearance, but on the tip and edges of the tongue where they are irritated by the teeth they readily ulcerate, forming a sinuous ulcer surrounded by a pearly-white, smooth, rounded border.

In the tertiary stage gummata may occur in the mucous membrane or muscular substance of the tongue. In the former situation they are usually small and multiple, apt to break down into small superficial ulcers, giving the tongue a fissured or furrowed appearance; when they heal they pucker the surface, causing great disfigurement. The deep or parenchymatous gumma occurs on the dorsum near the centre; when it breaks down it produces a deep cavity, the size of which is only fully appreciated when its sides are separated by the fingers.

The treatment of syphilitic affections of the tongue necessitates the administration of internal remedies suitable to the stage of the disease. In primary and early secondary syphilis a course of mercury must be prescribed; a very satisfactory preparation is the hydrarg. cum creta in 2½-gr. doses thrice daily. In bad cases it may be necessary to bring the patient rapidly under the influence of mercury; intramuscular injections are often valuable.

In late secondary or early tertiary syphilis the administration of mercury must depend upon the severity of the disease, the presence or absence of syphilitic manifestations in other parts of the body, and the amount of mercury the patient has taken in the earlier stages. In tertiary affections, iodide of potassium is essential. It should be given at first in 10-gr. doses thrice daily, and the dose increased to 30 gr. or more until the desired effect is produced. In early tertiary cases, especially when there is doubt as to the previous administration of mercury, this drug may be advantageously combined with the iodide. Local treatment is of more importance, and attended with more success, in secondary than in tertiary affections. Mucous patches should be carefully dried with blotting-paper and painted with 5 per cent chromic acid solution, or dusted with calomel and starch powder. Under these remedies mucous patches often disappear very quickly, and the patient gives up all treatment, to his subsequent detriment.

Various local remedies are used for tertiary ulcers, viz., nitrate of silver, alum, sulphate of copper, bicyanide of mercury, tannic acid, Mandl's solution, etc. As a rule it

is better to avoid caustic applications and to rely upon a mild alkaline mouth-wash of bicarbonate of soda. When there is much pain on eating, the surface of the sore should be dried and dusted with orthoform before each meal.

It is important that all sources of irritation should be removed as far as possible. The food should be plain and unirritating, smoking should be given up, and alcohol used but sparingly and well diluted. The condition of the teeth should be attended to, and the wearing of artificial dentures suspended.

When a chronic syphilitic ulcer has lasted for some time and induration is developing about its base, a portion should be excised for microscopic examination. The practice of giving a course of iodide with the idea of making the diagnosis between a syphilitic and a cancerous ulcer cannot be too strongly condemned.

It must be borne in mind that secondary syphilitic affections of the tongue and mouth are highly contagious ; it is therefore important that patients should be cautioned as to the risk of infecting others, and that dentists and others operating on the mouths of infected persons should be scrupulously careful in disinfecting their hands and instruments.

Tuberculous Ulceration may be primary or secondary. *Primary* ulcers are rare, but ulceration *secondary to tuberculous disease of the lungs* or larynx is not very uncommon : it may affect any part of the tongue, but most often the tip or border. The fully-developed ulcer has no characteristic shape ; it is usually roughly oval, with sinuous borders, uneven pale granulated surface covered by dirty-yellow viscid mucus, and sharply-cut or bevelled edges. In the later stages there is salivation and much pain. The submaxillary glands are often enlarged.

When the ulcer is small, single, and unaccompanied by active phthisis, it may be excised, especially if it be causing much pain and interference with eating and speaking. A wedge-shaped piece including the ulcer should be excised and the edges accurately sutured ; if a raw surface is left, it is sure to become infected.

In cases unsuitable for excision, much improvement sometimes results from scraping the ulcer under local anæsthesia and applying pure carbolic acid. If the disease is too advanced or the patient too ill for scraping, the ulcer may be painted daily with 20 per cent lactic acid solution. Shortly before meals the surface of the ulcer should be dusted with orthoform, or painted with a 5 per cent solution of eucaine. Morphia may be necessary at night. The condition of the teeth must be attended to and an antiseptic mouth-wash employed. The food must be soft and unirritating. General antitubercu lous treatment will of course be prescribed.

Edmund W. Roughton
(Revised by Wilfred Trotter.

TONGUE, TUMOURS OF.—(*See also* MOUTH AND PHARYNX, MALIGNANT DISEASE OF.)

Lymphangioma of the tongue is usually congenital. The lymphatic spaces are greatly enlarged, owing, it is supposed, to malformation of the efferent lymphatics. The tongue is greatly enlarged (*macroglossia*), so that it may protrude from the mouth ; by constant pressure on the front teeth and their alveoli, great deformity may result.

The only satisfactory method of treatment is to excise a wedge-shaped portion of the tongue, including as much of the lymphangioma as possible, and large enough to reduce the tongue to its proper size. Before operating, the mouth must be made as clean as possible, so as to minimize the risk of lymphangitis. The hæmorrhage is not usually very great, and stops when the sides of the wound are brought together by deep stitches.

Other methods of treatment, such as electrolysis, scarification, igni-puncture, and injections of irritating substances should be avoided, as they usually do more harm than good.

Nævi of the tongue may be capillary or venous. They are nearly all congenital but may sometimes commence to grow in adult life. They are easily recognized. When small they cause no symptoms unless accidentally wounded ; when large, they are apt to be repeatedly injured by the teeth, giving rise to hæmorrhage and septic infection.

Small nævi may be easily destroyed by the galvano-cautery at a dull-red heat the platinum needle is introduced into the substance of the growth and moved in a

directions so as to break it up. Larger nævi are excised, if possible, by the wedge-shaped method, cutting clear of the disease and approximating the sides of the wound with deep catgut sutures. For widely diffused nævi it may be advisable to tie the linguals, or to pass a temporary ligature around the tongue behind the growth, before proceeding to excise it. It may be necessary to use the cautery to arrest hæmorrhage, but this should be avoided if possible, as it interferes with primary union.

Papillomata usually occur on the dorsum of the tongue, but are sometimes seen on its under surface near the frænum. Care should be taken to avoid mistaking warty-looking condylomata for true warts. In young persons, warts (especially pedunculated) may be removed by the galvano-cautery under local anæsthesia. In older patients they should be more freely removed, especially if they are sessile and occurring on a leucomatous tongue; for such warts, if indeed they are not actually cancerous, are sure to become so sooner or later. The best plan is to excise the wart by two elliptical incisions going deeply into the substance of the tongue, so that the wound may be closed by sutures and healing by first intention secured.

Fatty, Fibrous, Cartilaginous, and **Osseous** tumours are extremely rare in the tongue. If recognized they may be enucleated after incising the tissues by which they are covered.

Sarcomata of the tongue are extremely rare. They have seldom been correctly diagnosed before removal. The proper treatment is to remove the portion of the tongue in which the growth is situated.

Edmund W. Roughton.
(Revised by Wilfred Trotter.)

TONSIL, MALIGNANT DISEASE OF.—(*See* Mouth and Pharynx, Malignant Disease of.)

TONSILLITIS, CHRONIC.—During the course of the exanthemata, or of diphtheria or mumps, the tonsils may become enlarged; a similar result may follow an attack or repeated attacks of acute follicular or parenchymatous tonsillitis.

For many years the original teaching of Morell Mackenzie, that it was only necessary in these cases to excise the projecting part of the tonsil, was followed, because it was thought that the obstruction to the airway was the only harm they did. Modern bacteriology, however, has shown that a great many of these enlarged tonsils are infected, and also that a tonsil may be infected and have the crypts full of pus without being enlarged. This chronic infection leads to auto-intoxication with its train of evils, such as chronic anæmia, neurasthenia, indigestion, arthritis, rheumatism, colitis and appendicitis, and also recurring inflammation of the eyes. Time and time again have patients had all their teeth removed for these conditions, only to find that they were no better, because the original trouble was not in the teeth but in the tonsils. These had been overlooked because they were small and could not be seen except by hooking back the anterior pillars on both sides. This can be done with a pair of fine catch-forceps. The crypts can then be seen to contain pus, either at once by direct vision, or by means of the throat mirror, or after the tonsils have been squeezed between the finger on the outside and the edge of the tongue depressor in the mouth. When asked by their physician if they have any trouble with their tonsils, patients often declare they not only have no trouble, but that it is impossible for them to have any, because the tonsils have already been removed once, and perhaps twice, in childhood. It is just in these cases, where the tonsils are hidden, or the removal has been incompletely done by the guillotine, that trouble is most often met with, and therefore no case should be pronounced free from tonsillar trouble until it has been thoroughly examined by a competent laryngologist.

It is now generally recognized, after much controversy, that the most satisfactory way of dealing with these chronically infected tonsils is complete removal with the tonsillar capsule. In the few cases in which surgical interference is contra-indicated, escharotic paste may be used. The removal can be done by means of: (1) The guillotine; (2) Dissection.

Where the tonsil protrudes so that the instrument can be forced round the whole of it, especially the lower lobe, it can be removed by means of the guillotine; but where it is long and flat and hidden behind the pillars, or bound down by fibrous bands, removal by dissection must be employed.

When it is intended to give an autogenous vaccine from the pus contained in the tonsils after removing them, they must not be treated with antiseptics for some days beforehand.

1. **Removal with the Guillotine.**—There are various patterns, but the original guillotine of Physick, modified by Morell Mackenzie and made for him by Mayer & Phelps, is the one the writer always uses, as it is the simplest. A general anæsthetic is not necessary unless there are adenoid growths present as well, as children object far more to having an instrument put up the back of the nose than into the mouth, and it is far less painful to remove tonsils than adenoids: in such a case the tonsils should be removed after the adenoids with the patient in the recumbent position as described under ADENOIDS. In the case of older children or adults, nitrous oxide gas, alone or combined with oxygen, may be used if the patient be very nervous, but as a rule it will suffice to paint the tonsils twice or thrice with a 10 per cent solution of cocaine.

The patient should be placed in a chair in front of, and on a level with, the operator, so that the latter can throw a good light into the mouth. An assistant should be behind to hold the head. The great mistake that beginners in the operation make is trying to use too big an instrument. The operator should have at least three sizes ready to hand, and use as small a one as possible. He should also remember that the tonsil will be smaller after the application of cocaine than when he first examined it.

The patient should be asked to hold tightly to the arms of the chair, or to give his hands to an assistant or nurse to hold. It is most important that he should not have them free to catch hold of the instrument. As most surgeons are right-handed, it is best to take the right tonsil first, as the tonsillotome is then held in the left hand, and as a rule children do not begin to struggle until the first tonsil has been removed. In the case of the right tonsil, the operator depresses the tongue with the right forefinger, and taking the guillotine in his left hand passes it into the mouth edgeways. The process of getting the tonsil into the lumen of the guillotine consists of four movements:—

(*a*) The back of the guillotine is pressed against the tongue, and its edge slipped under the dependent part of the tonsil and hooked up under it, and the guillotine is turned more flatly against the tonsil. (*b*) The hand is then carried across the mouth, and the top of the guillotine is made to slip in behind the back of the tonsil, between it and the posterior pillar of the fauces. (*c*) The guillotine is then turned quite flat against the tonsil and manœuvred until the top of the tonsil also is brought into the lumen. (*d*) The hand is then brought back to the left side of the mouth and strongly pressed, so as to force the whole tonsil into the lumen of the instrument; if necessary it can be pressed in with the forefinger. The blade is then pushed home.

In the case of children, the instrument should not be withdrawn from the mouth, as they may refuse to open the mouth again. It should be shifted to the right hand, and the left tonsil should be removed in the same way. Where the tonsils are of markedly different sizes, so that it is necessary to use different instruments, the second one should be introduced into the mouth before the first one is withdrawn. Many operators now work with the guillotine reversed, either for one or both tonsils. For many years this was the way the author removed tonsils alone, but now he always employs a general anæsthetic as he finds it easier to deal with any hæmorrhage that may occur.

The chief danger after tonsillectomy is that of hæmorrhage. The same inquiries should be made as before the operation on adenoids (*see* ADENOIDS), and if necessary the tonsils should be removed by the escharotic paste. In ordinary cases the hæmorrhage generally stops after a few minutes; but if it does not do so, the throat should be well illuminated to see if a tag has been left, which sometimes happens. The hæmorrhage will generally stop with its removal, or, if a small artery can be seen spouting, it should be caught with a long pair of forceps, and tied; but if the patient is restless and faint from loss of blood and cannot, or refuses to, show the throat properly, it is imperative to give a general anæsthetic, so that the exact source of bleeding may be discovered. Ice applied to the back of the neck, and also sucked, will be found very useful. A very good styptic is made by taking a teaspoonful of tannic acid and gallic acid and making them into a thick paste with a little water. A medium-sized swab of cotton-wool, held by a sponge-holder or pair of adenoid forceps, should be dipped into this mass and then applied to the bleeding spot and held there for five minutes, with counter-pressure on the outside. Pure adrenalin

or hazeline, or a concentrated solution of phenazone, applied in the same way, often causes the bleeding to cease.

The patient should remain quiet in bed for three or four days, and take only cold and soft food. The bowels should be kept freely open by means of a saline purge. Where possible, the writer always gives children full doses of bromide of potassium combined with arsenic for three or four days before and after the operation. It helps to soothe the patients' nerves, and certainly lessens the pain and sensibility of the pharynx. If there be much pain after the operation, $\frac{1}{12}$ to $\frac{1}{6}$ gr. of heroin or morphia may be given according to the age of the patient.

For local after-treatment, eusol, or 'Milton', or Condy's fluid diluted to a pale-pink colour, or carbolic lotion (1–80), or hazeline, or Pond's extract diluted to a half, may be used in the form of a spray or gargle several times a day, especially after taking food. If the pain be very great, which is generally due to the anterior pillars of the fauces having been cut, orthoform or anæsthesine will often be found very efficacious. Where the throat remains in a sloughing condition for some time, the process of healing can be hastened by swabbing with solution of peroxide of hydrogen (20 vols.) or collosol argentum.

2. **Removal by Dissection.**—(*a*) *Under local anæsthesia;* (*b*) *Under general anæthesia.*

a. Under Local Anæsthesia.—The operation may be done in an adult under local anæsthesia; a few drops of a solution containing 1 per cent of novocain and 1–4000 adrenalin, or eudrenine, should be injected into the tonsil through the top and bottom of the anterior pillar, also into the supratonsillar space and into the top and bottom of the posterior pillar, and ten minutes allowed for it to take effect.

With the patient seated in a chair as before, and an assistant holding the head, another assistant should hold down the tongue with a broad tongue depressor. The operator then takes hold of the tonsil with a pair of volsella forceps, such as Tilley's, which hold firmly, taking care not to include the anterior pillar. The tonsil is pulled forwards and inwards, and the anterior pillar is put on the stretch. Then with a sharp-pointed knife (such as StClair Thomson's septum knife) an incision is made firmly but gently through the edge of the anterior pillar until the white capsule is seen; when that appears the incision is carried down to the base of the tonsil. With a sharp separator the tonsil is then separated from the surrounding tissue in front, taking care neither to pierce the capsule nor to dig into the tissues. With the same knife the incision can be carried over the top of the tonsil. The writer uses a pair of scissors curved on the flat, with the external blade longer than the internal (one for each side), so that it slips over the capsule and tension can be put on the pillar to prevent it slipping and too much of it being cut.

When the top and back of the tonsil have been cleared by the separator, the grip of the forceps should be changed, and a new grip taken, getting in behind the tonsil from the front while avoiding the posterior pillar. The posterior pillar is now freed with the scissors as close to the edge as possible, and the tonsil pulled downwards and inwards while the separator works behind. When the tonsil is freed, except its very tip, a snare can be slipped over it and slowly tightened until the tonsil is removed. Any bleeding points can be seized with a long pair of artery forceps and tied.

b. Under General Anæsthesia.—The writer has seen some dire results after so-called enucleation, imperfectly performed, such as the uvula and a large part of the soft palate being sliced off, large perforations left in the pillars of the fauces, and adhesions between the soft palate and posterior wall of the pharynx, and scarring of the soft palate, leading to permanent impairment of the voice.

A great many fatalities under the anæsthetic and from hæmorrhage have also happened, many of which have not been reported. Of those that have, some have been put down to 'status lymphaticus', others to suffocation from blood getting into the lungs, and others again to hæmorrhage after the operation is over and the patient has been put back to bed.

The writer is of opinion that none of these accidents need happen, and that the operation is practically without danger either from the anæsthetic or from hæmorrhage provided a certain special technique is carefully carried out, the steps of which are as follows: —

i. The patient must be so profoundly anæsthetized that all laryngeal and pharyngeal reflexes are abolished, as it is impossible to perform this operation or to tie the arteries on a patient who is gagging or coughing, and furthermore under these conditions blood is

almost certain to be inspired into the air-passages, and this will lead to great trouble and possibly death.

ii. The operation must be slowly and deliberately performed in such a position that a perfect view, and perfect access to the parts, is obtained.

iii. Mechanical means must be employed to prevent blood entering into the air-passages.

iv. All bleeding must be arrested by ligature of vessels *before the patient leaves the table*, as in all other surgical operations.

As far as the writer's personal experience goes, the first condition of profound and yet safe anæsthesia can only be obtained with ether, and the second by having the patient in the recumbent position as already described under ADENOIDS. The mouth having been opened with a suitable gag, a pair of clip forceps are placed transversely through the dorsum of the tongue, about one inch from the tip. The tongue can thus be pulled forward out of the mouth without traction being put on the frænum. The forceps are then held by the anæsthetist or by an assistant between the forefinger and thumb, while the middle and ring fingers rest on the jaw-bone, taking care not to let them slip off the point of the bone, and push up the tongue from below. This gives a perfect view and complete access. At this stage the writer puts some drops of castor oil into the eyes, which prevents them being affected if any pus or blood comes through the nostrils and by any chance runs into them. The blood in this position runs into the pharynx, and is mopped up by strips of gauze held by long forceps. The strips must not be sewn round the edges. As the writer works with a headlight on his own forehead, he also provides one for the assistant or whoever is doing the swabbing, so that the throat is always illuminated even when the operator turns away to get another instrument.

The operation is performed in the same way as described above, but as there has been no local anæsthetic injected the bleeding may be more profuse. Immediately one tonsil has been removed, a swab dipped in hazeline is put into the cavity and then a dry one put over it, and pressure applied for a few minutes between the finger inside and the thumb outside. The swab in the cavity is then gently removed, and, if bleeding is still going on, careful search is made for the bleeding point. This is best done by putting a long pair of fine catch-forceps on the anterior pillar and another on the posterior, and opening up the cavity. These can be held by an assistant while the operator puts a swab in; on quickly removing this swab the usual bleeding point will be seen to be high up. This can be caught by a long pair of artery forceps and tied either directly or by passing a ligature behind by means of a curved needle and then tying it. The next common place for the bleeding to occur is at the very bottom of the cavity at the base of the tongue. It is because this is so often overlooked that the case is said to be one of general oozing and resort is had to stitching the pillars. Careful swabbing and search, however, will always enable the artery to be found and tied. Thirdly, there may be one or two bleeding spots on the anterior or posterior pillar which cease when the pillar is put on the stretch and begin again when the forceps are taken off. This gives a clue to where the bleeding artery is, and it can easily be caught and tied. After that a piece of dry sterilized cotton-wool is put into the cavity and left while the second tonsil is removed, and the same procedure employed.

By making this careful search when persistent oozing occurs, the writer for the last few years has never failed to find a definite bleeding point, and has not found it necessary to stitch the pillars, nor has he had a case of so-called secondary hæmorrhage. The after-treatment has already been described.

Escharotic Paste.—This method, originally introduced by Morell Mackenzie, fell into desuetude owing to the pain it produced. It has lately been revived by Irwin Moore (*Jour. Laryngol.*), who has devised a set of special applicators, which are made by Messrs. Mayer & Phelps. Under the influence of cocaine it becomes a painless operation. It is applicable in those cases in which surgical interference is contra-indicated. Furthermore, the writer strongly advises it in singers or in those whose living depends on their voice, as it leaves no untoward results. It has also the great advantage of not removing the capsule, so that there is no likelihood of the pillars of the fauces becoming adherent and causing the close approximation of the soft palate and the back of the tongue, thus lessening the size of the pharynx and its value as a resonator of the voice; but it has the disadvantage of requiring a good many sittings, with a week's rest between, as only a little can be removed at one sitting.

George C. Cathcart

TOOTHACHE.—(*See* TEETH, CARIES OF.)

TORTICOLLIS.—(*See* WRY NECK.)

TORTICOLLIS, CONGENITAL.—By congenital wry neck we mean the condition due to shortening of the sternomastoid muscle present either at birth or soon after.

In considering the rational treatment of this condition, we must first consider briefly: (1) *The cause*: and (2) *The morbid anatomy.*

1. **Cause.**—*a.* Ischæmic contraction of the lower two-thirds of the muscle (*Fig.* 74). The so-called hæmatoma in the newly-born child which is followed by torticollis is a post-obstructive œdema, and the condition of the muscle is comparable to the condition of the forearm muscles in Volkmann's contracture.

b. Malposition in utero.

c. Syphilitic infiltration or definite gumma in the sternomastoid—very rarely.



Fig. 74.—The so-called 'hæmatoma' of the sternomastoid. There was no bruising, and no history of difficult labour.

2. **Morbid Anatomy.**—It is more common in girls than boys. Right and left sides are affected in about equal numbers. The sternal head is affected more than the clavicular, and so, as a rule, rotation is more marked than flexion. As the child gets older, secondary deformities appear—i.e., other muscles and their fasciæ become shortened, the face on the affected side lags behind in development (although this asymmetry may only become obvious to the parents after the head has been put straight), and the base of the skull and the upper dorsal spine become twisted or scoliotic from the scoliosis in the cervical region. (*Fig.* 75.)



Fig. 75.—Congenital torticollis in child, age 8. Note contraction of sternal head on right side; lateral curvature and rotation in cervical region: displacement of head bodily toward the left; right side of face smaller than the left side.

TREATMENT.—Treatment must be begun as soon as the condition is diagnosed, in order to prevent the asymmetry and the high dorsal scoliosis, this latter being exceedingly difficult to remedy. If the shortening of the muscle be remedied before puberty, the asymmetry of the face will disappear, but this cannot be expected after that age. In addition to the administration of mercury, there are three forms of treatment: (1) *Mechanical*; (2) *Manipulative*; (3) *Operative.*

1. **Mechanical.**—Treatment by an artificial sternomastoid on the opposite side is useless, no instrument being equal to the surgeon's hand.

2. **Manipulative.**—This will bring about a cure up to the age of six months. It may be tried in mild cases up to the age of three years.

Supposing the left sternomastoid be contracted: while an assistant holds down the left shoulder, the surgeon stands behind the child's head, his left hand holding the chin with the palm, the fingers passing up the right side of the face. His right forearm rests against the right side of the child's head; the palm of the hand rests on the top of the head, the fingers are on the left side of the vertex. With this secure

grip the head is rotated so as to stretch the shortened muscle. This manœuvre is carried out by the doctor for three or four minutes at a time every two days, when the deformity is well over-corrected as a rule. The child's mother or nurse is then taught to repeat it every morning to prevent recontraction. The manœuvre has been performed under an anæsthetic in older children, but is then certainly not free from risk. Besides the above manipulation, care should be taken that when the child is in its cradle or being carried on the nurse's arm, any tendency for the head to fall to one side by gravity should be in such a direction as to stretch the shortened muscle.

3. **Operative.**—Excision of the lower two-thirds of the muscle has been advocated; it is an unnecessary and mutilating operation. Lengthening of the muscle by a plastic operation has also been practised, a treatment unnecessarily complicated. Operative treatment consists in section of the muscle, either subcutaneously or by the open method. The subcutaneous operation has been given up. It might be done if only the sternal portion were affected, the clavicular fibres not having become secondarily contracted; or it might be done by some surgeons if the parents refused consent for an open operation.

Division of the sternomastoid by open operation, therefore, is the operative treatment. It may be divided at the upper end, so that the scar is hidden by the hair; it has been done in the middle of the muscle, but the scar is obvious, and the spinal accessory nerve and the vessels of the neck are in danger. The muscle ought to be divided at the lower end. If both heads are contracted, make an incision parallel to the clavicle; the resulting scar will be hidden by a necklace in later life. If the contraction is more marked in the sternal head, make an oblique incision, and the scar of this will, as the head is restored to the normal, be stretched longitudinally and be really invisible. There is no need for any apparatus after the operation. For the first ten days the child's head is kept rotated to the same side as the operation, between sand-bags in bed. Following this, passive and active movements prevent re-contraction quite effectually. *Robert Milne.*

TRACHEA, FOREIGN BODIES IN.—(*See* Foreign Bodies in the Air-passages and Œsophagus.)

TRACHEOTOMY.—(*See* Laryngeal Obstruction.)

TRACHOMA.—(*See* Conjunctiva, Diseases of.)

TRANSFUSION.—The topics to be considered under this head are the intravenous administration of blood, of gum solution, and of normal saline. The principal indication common to all three is for the purpose of reviving a patient suffering from hæmorrhage or shock; others will be considered under the respective headings.

These remedies may be arranged either according to the order of convenience of use, or of efficacy, and the one is unfortunately the reverse of the other. It has been abundantly proved that whilst normal saline is easy to give, the fluid so soon escapes through the capillary walls into the tissues that any benefit conferred is of a transitory description, lasting at most a few hours, and often less. It seems essential, to retain the introduced fluid in the circulation, that it should contain either colloid, such as the protein of blood plasma or gum acacia, or red blood-corpuscles. It was shown during the War that transfusions of blood are the most effectual. Opinions differed with regard to gum; some considered that it was as good as blood, others that it was decidedly inferior. There is no doubt that gum solution is more lasting in its benefits than salines. It seems probable that a principal function of serum albumin and serum globulin is to keep the water of the plasma within the vessels.

It is the duty of the medical attendant to provide his patient with the best treatment possible, and therefore blood transfusion, although complicated, ought to be the method of election.

BLOOD TRANSFUSION.

Indications for Blood Transfusion, and Results.—The following are the principal *indications*:—

1. *Severe Primary Hæmorrhage.*—It is in this condition that the treatment finds its most obvious rationale and its most impressive successes. A great number of surgeons at casualty clearing stations in France were deeply impressed with the value of the method.

2. *Pernicious Anæmia.*—Unger, Kimpton, and others believe that blood transfusion is the best treatment we have for pernicious anæmia. It appears to act not so much by directly increasing the volume or oxygen-carrying power of the blood, as by stimulating the red marrow to renewed activity and so bringing on a remission of the anæmia. Unger reports 23 transfusions for 15 cases. "The lives of five patients were saved as a direct result of the transfusions; five were greatly improved; the remaining five died within a comparatively short time. As a result of repeated transfusion, two have done well for a period of about two years, and another for a period of eight months." It is not claimed that permanent cure will be obtained. Small transfusions seem to do as well as large. A patient with this disease for whom the writer performed blood transfusion twenty months ago, when he appeared to be dying, made a most spectacular recovery, and is getting about still.

3. *Hæmophilia.*—Unger gave eight transfusions for seven patients, and all recovered. In five the procedure was life-saving. It checks the bleeding, but does not cure the disease.

4. *Anæmia.*—The method is of use for secondary anæmia, whatever the cause. Kerley reports good results in the secondary anæmias of children under 2 years of age. Seven out of eight cases did well.

In leukæmia and purpura hæmorrhagica the results were not good (Unger).

5. *Staphylococcus Septicæmia.*—Hooker relates five cases of osteomyelitis and maxillary antrum infections leading to septicæmia, in which a donor was inoculated with a vaccine obtained from the patient's discharges, and the immune blood transfused a few days or weeks later. All the patients were very ill, but three recovered.

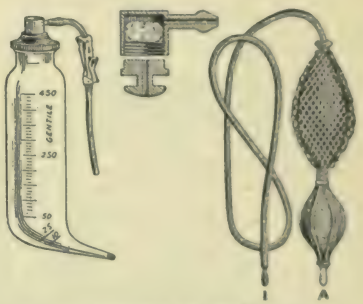


Fig. 76.—Apparatus for blood transfusion (*Jeanbrau*).

6. *Hæmophilia Neonatorum.*—Lewisohn transfused blood for eight cases of this condition, and in each the bleeding promptly stopped.

Technique.—Quite a number of methods are in use. They fall into three groups: (1) *Direct transfusion;* (2) *Transfusion of unmodified blood;* (3) *Transfusion of citrated blood.*

1. The writer's earliest attempts were with a *direct method* (after Fullerton). The radial artery of the donor and the basilic vein of the patient were dissected out under novocain anæsthesia, and a thin rubber tube about six inches long with a silver cannula at each end, sterilized and filmed by boiling in paraffin, was used to connect the artery with the vein. In the first two cases the result was remarkable and satisfactory; in two more cases no good was done, and it is certain very little blood passed.

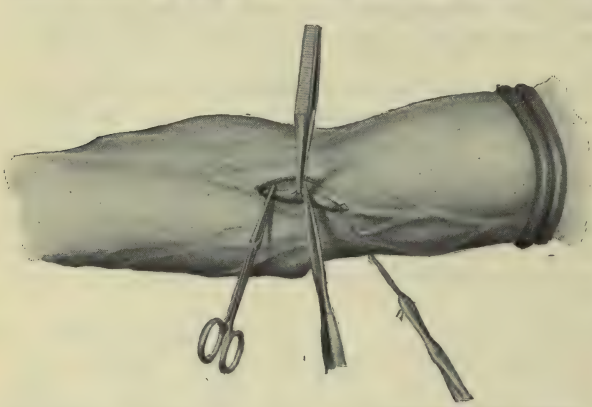
The technique is somewhat difficult, and one can never be sure how much blood is given, which is a great drawback. When one finds how much force may be necessary to drive in the blood by other methods if the veins of the patient are in a state of spasm, as they frequently are, one doubts very much whether any at all may be conveyed by the direct method in such cases. It is also difficult to know how long to let the blood flow; twenty minutes is said to be a suitable time, or until the donor feels faint. The method ought to be abandoned.

2. *Transfusion of Unmodified Blood.*—The procedures in general use falling under this heading are Kimpton's, Unger's, and Lindemann's.

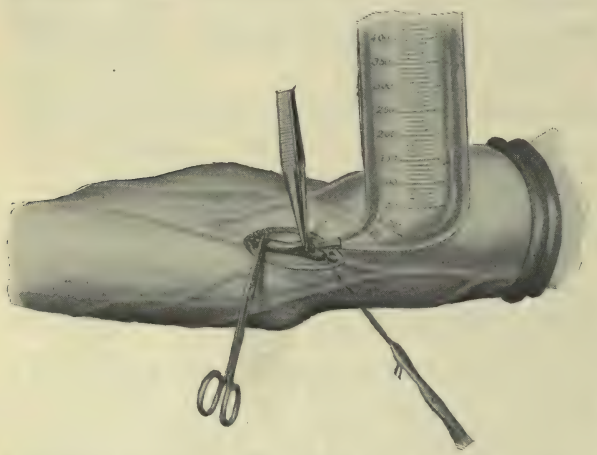
In Kimpton's method, a glass cylinder holding about 500 c.c. is drawn out at the lower end to a cannula-point (*Fig.* 76). To the top end a pump is connected which can suck up the blood from the vein of the donor, and drive it into that of the patient. The illustrations (*Figs.* 76, 77) are self-explanatory; they represent a French modification (Jeanbrau's). It will be observed that the bellows are reversed for the suction and the transfusion respectively, and that there is a little chamber at the top of the cylinder containing cotton-wool as a germ filter. The cylinder is sterilized and paraffin-filmed by boiling in water with a layer of paraffin on the surface; the cylinder is removed in the vertical position so as to coat its inner surface. In contact with a good film, blood remains unclotted for ten or fifteen minutes.

In Unger's method, a syringe with a four-way stop-cock is used, and the passages are kept flushed with saline to avoid clotting. It is not paraffin-filmed. An ether spray is directed on to the barrel of the record syringe to cool the blood below the temperature at which coagulation readily occurs (*Figs.* 78, 79).

In Lindemann's method, one cannula is introduced into the donor's, and another into the patient's vein. By means of a 20 c.c. record syringe, blood is drawn from the one and injected into the other. Between each syringe-filling the cannulæ are washed out with saline. Several syringes are needed, and they are lubricated with liquid paraffin. The method is simple, but one wonders whether the blood may not be disposed to clot *after* it has been transfused into the receiver.



A.—Method of incising vein of donor to admit the point of the cylinder.



B.—The point of the cylinder gently inserted in the vein, in the direction of the distal portion.

Fig. 77.—Jeanbrau's Modification of Kimpton's method.
Redrawn from the 'Lyon Chirurgicale'.

It is difficult to say whether the use of unmodified blood is safer and more physiological than that in which coagulation has been prevented by citration. Accounts differ. Certainly there is greater risk of massive clotting, and therefore failure of the operation in spite of the donor's sacrifice, when no chemicals are used. The less expert the operator, the more likely is this to occur.

All these methods, also, require that the donor and recipient shall be brought together, which is not always desirable.

3. *Transfusion of Citrated Blood.*—Probably the best method is that worked out at my own casualty clearing station by Capt. Lindsay and myself, and improved on by Capt. O. H. Robertson (*Fig.* 80).

The bottle holds 20 to 30 ounces. I used to paraffin-film the inside by leaving a little paraffin (m.p. 42° C.) inside before autoclaving it, but this is not really necessary. Into the bottle is put 160 c.c. of 3·8 per cent solution of sodium citrate (isotonic). The tubes must be kept very clean, and the needles sharp and well oiled.

Procedure for Obtaining and Giving the Blood.—The donor lies down with the arm extended. The front of the elbow is iodined, a bandage applied to the upper arm, and the vein made to stand out by slapping the arm and directing the patient to make and unmake a fist. A little novocain is injected over the vein, the skin nicked with a scalpel (to keep needle sharp), and the needle introduced into the vein, point towards the hand. A little suction is made by the pump to keep a slight negative pressure in the bottle. If there is difficulty in finding the vein, it may be cut down upon under novocain and a cannula inserted.

The bottle stands in water at 100° F., and is well agitated in order to mix in the citrate thoroughly with the blood. Take 20 ounces, more or less, as desired. The bottle is graduated. It is important to do the whole of the little operation as cleanly as possible. Bungling attempts to hit the vein lead to clotting in the vein, needle, and tube.

The bottle is now taken to the patient. A delay of half an hour, though undesirable, is not seriously harmful. The patient is prepared like the donor, but it is often necessary to cut down on the vein because of the troublesome vein-spasm. Take care not to inject air. The bottle is prepared with two needles, so that if one blocks the other may be available. Considerable pressure is often needed to force in the blood, and the stopper of the bottle may 'jump'. If the vein is too contracted to admit blood, I usually cut down on the internal saphena at the groin. If the blood is given too fast the patient may complain of a sense of bursting in the chest, or all over; this soon passes if he breathes deeply and the flow is checked for a minute or two.

It takes ten to fifteen minutes to inject a pint of blood.

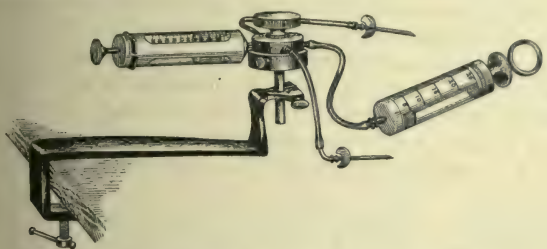


Fig. 78.—Unger's instrument for syringe transfusion: The recipient's cannula is seen above, the donor's below. On the left is a record syringe for aspirating and injecting blood; on the left is the saline syringe. At any one moment saline solution is forced through that cannula through which blood is not passing. This automatic shunting is accomplished by the stopcock.

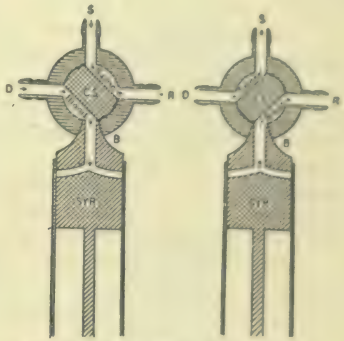


Fig. 79.—Blood Transfusion (Unger).

A.—Donor's position: D, donor's outlet; B, blood outlet; SYR, blood syringe. Blood passes from donor's vein through D, and out at B into SYR. S, saline outlet; R, recipient's outlet. Saline solution is forced from saline syringe through S, out at R into recipient's vein. C S, central stopper (rotates through an arc of 90 degrees).

B.—Recipient's position; SYR, blood syringe; B, blood outlet; R, recipient's outlet. Blood is forced out of SYR through B, out at R, into recipient's vein. S, saline outlet; D, donor's outlet. Saline solution is forced from saline syringe through S out at D into donor's vein. C S, central stopper.

Some observers have been very unnecessarily concerned as to the toxicity of sodium citrate. I have several times given much larger quantities than the 6 grm. put into the bottle, without any harm resulting. Hedon finds that 4 grm. is a safe dose for a dog. If one thought symptoms were due to the citrate, calcium chloride could be transfused. Nor is there any fear that the patient's blood will be rendered less coagulable. We found no change in the coagulation time after citrated-blood transfusions; Hedon and others find that the coagulation time is reduced.

Risks and Reactions.—The risk to the *donor* is trifling. The only case in which I have seen harm to the donor was a patient sent under my care who had had blood taken elsewhere, and the internal cutaneous nerve was included in a ligature (verified by operation). He got a troublesome reflex neurosis of the hand and arm. I am told that in America there are professional donors who allow themselves to be bled every three or four weeks at so much a time.

The risk to the *receiver* is slight if the two bloods are compatible, but there is a 30 per cent risk of hæmolysis if they are not tested, and in 5 to 10 per cent the reaction may be alarming or fatal. Syphilis has been conveyed; I have been told of such cases by eye-witnesses, but have not seen it myself. This risk could be excluded by taking a Wassermann. Probably malaria also might be transmitted.

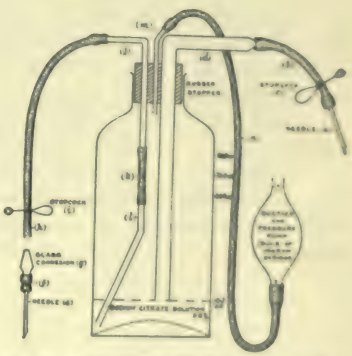


Fig. 80.—Robertson's transfusion apparatus.

If hæmolysis occurs as a result of the injection of an incompatible blood, symptoms usually appear during the transfusion. They are vomiting, dyspnœa, an urticarial rash, quick weak pulse, and perhaps convulsions or coma. Vomiting by itself is not necessarily a danger sign, and a sense of oppression in the chest may be due to too quick transfusion, not hæmolysis. After the injection, hæmoglobinuria may occur, and a few

deaths are reported. If the transfusion is immediately stopped, serious trouble may be averted.

Even when the blood of a donor of the proper group is used there is a small risk (2 in over 200 cases, Kimpton).

Apart from severe symptoms due to hæmolysis, milder signs of a toxic effect are not uncommon. A slight rigor sometimes occurs half an hour afterwards, or an urticarial rash. Some fever is common ; in 63 per cent it is 100° or over. It only lasts a few hours ordinarily. A symptomless polymorphonuclear leucocytosis is often met with. Large transfusions (over 200 c.c.) are more apt to produce reactions than small ones. Second or third transfusions give rise to rather more reactions than the first.

Group-testing.—Strange to say, the bloods of different individuals, even of the same family, are not always compatible. Shortly after birth the blood takes up the characters of one of four groups, and these apparently persist throughout life unchanged. The blood of a patient of a particular group may be given safely to another person of that group, but not necessarily a person belonging to another group. The incompatibility lies in two directions : One blood will (*a*) agglutinate and (*b*) hæmolyze that of a patient of another group. It seems to be established that a blood which hæmolyzes another will also agglutinate it ; this is convenient, because it is simpler to test out the agglutination reaction than the hæmolysis.

According to Moss, there are four classes of bloods, designated as Groups I, II, III, and IV. The relative proportion of these groups (in America), and their suitability as donors, are given in the following table :—

Donor	Percentage frequency	Suitable if patient belongs to
Group I ..	5	Group I
„ II ..	40	„ I, II
„ III ..	10	„ I, III
„ IV ..	45	„ I, II, III, or IV

When the blood of a Group IV donor is given to a Group I, II, or III patient, the plasma of the donor has a tendency to hæmolyze and agglutinate the corpuscles of the patient ; but the plasma of the patient does not so act on the corpuscles of the donor, and it is found in practice that what matters is the effect of the patient's plasma on the donor's corpuscles, not the reverse. This is, no doubt, because the bulk of the patient's own blood is much greater than that of the transfused blood.

The easiest method of determining the blood-group of a donor is Vincent's (*Fig.* 81). It is necessary to obtain and to keep in stock the serum of a Group II, and also that of a Group III. This is obtained by collecting 20 c.c. of blood under aseptic conditions and allowing it to clot and the serum to separate out. Sodium citrate is added to make a 1·5 per cent citrated serum, and 0·25 tricresol as a preservative. It is then put up in capillary tubes and will keep for months or years.

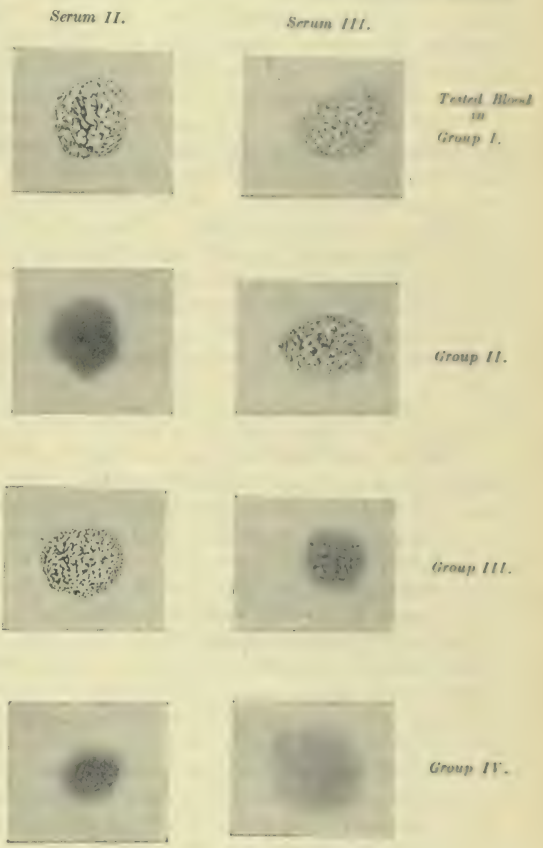
To make the test, a glass slide is taken, and a drop of Group II serum put near one end and a drop of Group III serum at the other. The would-be donor's ear is pricked, and with a couple of match-sticks a very little blood is mixed into each of the serum-drops. The result may be as follows :—

Blood-corpuscles agglutinated by	Donor is
Group II serum *and* Group III serum ..	Group I
„ III „ but not Group II serum	„ II
„ II „ „ „ „ III „ ..	„ III
Neither serum	„ IV

The agglutination is quite obvious to the naked eye in about five minutes.

In choosing donors, one may either use one belonging to the same group as the patient, or a Group IV donor. Group IV individuals are the universal providers. Thus, if a Group IV donor is available, it is not necessary to know what group the patient belongs to. On the other hand, if the patient and the donor both belong to Group II, the bloods will be compatible.

If one has not the two-group sera in stock, it is necessary to test the patient's serum against the donor's corpuscles directly. Draw off a few c.c. of blood from the patient, and allow to clot in a tube. Obtain a *large* drop of quite clear patient's serum, and add a trace of citrate solution. Mix in a *very little* of the donor's blood. If agglutination occurs in five minutes, the donor is not suitable; if there is no agglutination, the donor's blood may be used for transfusion.



Redrawn from the 'Journal of the American Medical Association'.

Fig. 81.—Vincent's method of grouping donors' and patients' blood.

GUM TRANSFUSION.

The indications for the use of gum transfusion are: Hæmorrhage; The shock-hæmorrhage complex; Pure shock; Cholera. There is no doubt whatever that the method is of established value for the first two, and some claim that it is as good as blood transfusion; but there is a weighty body of opinion, amongst experienced surgeons who worked at casualty clearing stations during the War, that both in theory and in practice the use of blood is preferable. It must be admitted, however, that blood cannot always be obtained at short notice, and gum can, or ought to be. Cases of pure shock are not frequently met with, and the value of gum transfusion is uncertain. For collapse due to infection it is useless. In cholera its value has not been sufficiently worked out.

Gum acacia is not quite such an unphysiological substance as might be imagined. It consists of a mixture of polymerized anhydrides of galactose and arabinose, both sugars, of which galactose is a normal substance, being formed regularly in the intestine from the splitting of lactose by the succus entericus. Lactose is absorbed into the blood-stream as dextrose and galactose. Gum slowly disappears from the circulation, though it takes days or weeks to do so. It appears to be perfectly innocuous.

The solution is 6 per cent gum arabic dissolved in 0·9 per cent sodium chloride in water. The water should be fresh and doubly distilled. The gum should be in large, clear, colourless lumps called 'Turkey elect'. It is placed in water for a day and allowed to swell, then dissolved in the proper quantity of saline solution boiling over a water-bath. The gum solution must be filtered through flannel to remove solid particles. It may then be boiled again, and kept in hermetically sealed flasks.

Method of Administration.—It is possible to introduce the fluid into the vein by a needle, but ordinarily the vessels are so contracted that it is simpler to inject a little novocain, cut down upon the median basilic vein in front of the elbow, and inject through a cannula made of metal or glass.

A funnel holding 3 or 4 ounces, three feet of rubber tubing, and the cannula are boiled. The sterile gum solution is warmed to about 110° F. The skin over the front of the elbow is painted with iodine, and a tourniquet or bandage applied above to distend the vein. Slapping will often make it more visible. Novocain is injected into the skin, and an incision made in the line of the vein, one inch long. The vein is carefully dissected quite free for half an inch. Most failures are due to neglect of this precaution. By means of an aneurysm needle a double loop of catgut is passed beneath it; one loop is tied round the vein at the lower end of the incision. With *sharp-pointed* scissors the vein is then snicked half through, the upper lip of the snick held open with forceps, and the cannula slipped in. Warm gum solution must be flowing from the cannula whilst this is done, to avoid injecting air. Then the upper ligature is tied round the vein over the groove in the cannula, and the tourniquet removed.

The gum solution is poured from the bottle into the funnel, and the outflow from the cannula, after running long enough to warm up the apparatus, should first be played on to the bulb of a thermometer to test the temperature. This should be about 100°. The usual dose is one pint, and it should run in with the funnel raised about two feet, and take fifteen minutes entering. A second pint may, if necessary, be given later.

If sediment has formed at the bottom of the bottle of gum solution, avoid shaking it up, and do not give the turbid part.

At the end of the transfusion, the ligature over the nozzle of the cannula is cut, and a fresh ligature passed round. Then withdraw the cannula, and tie the vein above the slit. Put in one or two skin stitches, and apply a dressing.

INTRAVENOUS SALINE.

Saline injections may be resorted to, as second best, for their 'tiding over' benefit, when blood and gum are not available. Hypertonic saline transfusion is of established value in cholera, and normal saline in blackwater fever.

The preparation of the solution for intravenous injection demands special care. The proper proportion of salt is 0·9 per cent, this being the concentration which will not harm the red or white corpuscles or capillary endothelium by inducing osmotic changes. The water must be doubly distilled. It has been shown that water first distilled, kept, and then boiled, will give rise to fever if several ounces are injected into a vein, because it contains the dead bodies of bacteria. Even freshly distilled water is not wholly free from reproach in this respect; perhaps some unknown volatile bodies are carried over, and are only removed by double distillation. It is greatly preferable that the water to be used should have been doubly distilled within a few hours of use. The salt is added after distillation, and the solution boiled again. In practice, this may be impossible. When an intravenous injection is wanted, it is often wanted urgently, and it is useful to keep stored a quart flask ready made up, either wool-stopped with a tinfoil cap or hermetically sealed, to be warmed up and used in case of emergency.

The technique of administration is just like that described for giving gum solution, and need not be repeated. The dosage should not be more than a pint to a pint and a half, and even this is risky if the kidneys do not function well. It has been shown that there is real danger of inducing œdema of the lungs by a large infusion.

It is more physiological, and probably better, instead of sodium chloride to use tablets containing salts and dextrose in the correct proportions for making up into Ringer's fluid. Such tablets are on the market.

Alkaline transfusion was tried during the War, but without advantage, in cases of shock and hæmorrhage. It may be used in diabetic coma. I remember seeing one patient, who was quite comatose in the morning, revive so much after an alkaline transfusion that in the afternoon he was sitting up in bed eating an orange (without leave). He relapsed and died a few days later. Two pints of sodium carbonate solution, 4 drachms to the pint, were given in this case. *A. Rendle Short*

TRIGGER FINGER.—This is a condition not infrequently seen, in which the patient, on attempting to extend the fingers actively, finds that one finger remains partially flexed. On extending it passively with the other hand, the obstruction is overcome with

a distinct snap. I have seen it in the thumb and the ring finger. It is an annoying rather than a crippling trouble.

An attempt must be made to localize the obstruction. The commonest site is opposite the metacarpophalangeal joint. If it cannot be localized, fixation on a splint, and massage, with the administration of iodide, has sometimes been successful in relieving the condition. If this treatment be unsuccessful, the tendon must be exposed if the patient wishes it or if the site of the obstruction can be localized, operative treatment then being the method of cure. We may find: (1) A localized thickening of the tendon, which must be pared down. (2) Perhaps a cyst in the tendon, analogous to ganglion, which may be removed. (3) An adhesive band over the tendon. (4) A thickening of the tendon sheath, leading to narrowing of its lumen. Or there may be various other pathological conditions, which must be dealt with in an appropriate manner. *Robert Milne.*

TRYPANOSOMIASIS.—The treatment of this disease during the early stages of pyrexia has sometimes succeeded. In the advanced stage, when cerebral symptoms have supervened, no treatment is effective.

Arsenic is the drug that has been most efficacious, but large doses are required. Liquor arsenicalis causes symptoms of arsenical poisoning, even when the dose is very gradually increased. Few persons can acquire tolerance for the large doses required, and its use has to be discontinued in the majority of cases, as symptoms of poisoning supervene.

Hypodermic injections of various preparations, usually in combination with aniline, enable larger doses of arsenic to be administered with less risk of poisoning. The preparations now used are those that have been successfully employed in infections of lower animals with the *Trypanosoma gambiense*. The doses given to men with promising effects are those mentioned.

Trypanroth 0·9-gr. doses, chrysoidin $\frac{1}{10}$ to $\frac{1}{2}$ gr., parafuchsin 5 to 20 gr. in cachet by the mouth, have been used with some benefit, but now the use of these drugs has been discontinued, as atoxyl has a much greater effect. They are sometimes given alternately with atoxyl.

Atoxyl, a compound of arsenic, has given good results in the lower animals. Todd proposes the administration of large doses intravenously. Intramuscular injections in man appear to control the course of the disease, but even with doses of 30 min. of a 10 per cent solution, symptoms of poisoning have occurred. It is well to begin with small doses, such as 10 min., and gradually increase the dose, stopping the treatment for a day or two if any symptoms of poisoning occur. Marked improvement is usually manifest when the dose is 20 to 25 min.

In cases of apparent cure the treatment must be continued for a long period, at least two years, as recrudescences occur, even in cases where no parasites have been found for several months.

This method of small or moderate doses continued for a long period has so far given satisfactory results. In the tropics, with natives, much larger doses are given and repeated in two or three weeks. With this method, though the immediate results are satisfactory, relapses nearly always occur. A number of the patients have developed amblyopia, optic atrophy, peripheral neuritis, and gastro-intestinal trouble. Antimony preparations have been highly successful in lower animals, and in man have a more rapid effect than atoxyl, but the local effects are severe, and tissue necrosis is induced. In Lambkin's medium, with specially prepared metallic antimony, better results are obtained, but in one case, both as 5 per cent and $2\frac{1}{2}$ per cent solutions, it led to the formation of large painful abscesses. The sodio-tartrate of antimony in $\frac{1}{2}$-gr. to 2-gr. doses in 4 ounces of normal saline ($\frac{1}{2}$ to 1 per cent solutions) is given as an intravenous injection. A sharp reaction, severe rigor, much salivation, and some cough may follow, but the results as regards the trypanocidal action are most marked. In other cases no such severe reaction has occurred. The trypanosomes will reappear in a few days unless the injection be repeated every three or four days. In atoxyl-resistant cases, such as most of those from Rhodesia, antimony is the only hope. Metallic antimony very finely divided has also been used in these cases as an intravenous injection in doses of $\frac{1}{4}$ to $\frac{1}{2}$ gr. The rigor is delayed, but on the whole the reaction is more severe than with the larger doses of tartar emetic.

though the effect is more persistent. It is best given as intravenous injections, but these must be repeated at intervals of three days or so for a prolonged period. Salvarsan and copper salvarsan have only temporary good effects. Tartar emetic by mouth or rectum has some effect, but is not to be relied on alone in bad cases. Other forms of antimony have been used and are sometimes better borne. In one case, even after convulsions had set in, injections of the acetyl-stibiate of soda were followed by a most remarkable improvement. Perchloride of mercury ($\frac{1}{2}$ per cent solution) in 15- to 30-min. doses is given by some alternately with atoxyl: so that the atoxyl is discontinued for one or two weeks whilst the mercury is given, and then the mercury discontinued and the use of atoxyl resumed. By this method it was believed that the resistant forms of the trypanosomes might be destroyed. The method has not been markedly successful in man. The effects of salvarsan are favourable for a time, but the results are not permanent.

Sleeping Sickness.—Negro-lethargy is one of the fatal terminations of chronic trypanosomiasis. When the symptoms are established, no treatment appears to have any effect. It is justifiable to try large intravenous doses of any of the drugs that exercise a beneficial effect in trypanosome disease, as the sleeping sickness is invariably fatal. Life may be prolonged by careful nursing and feeding.

Modern experience tends to show that in Europeans, at any rate, even when there are cerebral changes, antimony in some form or other should be persisted in as holding out the best hopes of a cure. The tartrate or the acetyl-stibiate of sodium should be persisted in over a long period; of the latter drug 6 grm., or even more, may be given altogether. *C. W. Daniels.*

TUBERCULOSIS.—(*See* Bone, Tuberculous Disease of; Epididymitis, Tuberculous; Larynx, Tuberculosis of; Peritonitis, Tuberculous; Pulmonary Tuberculosis; etc.)

TUBERCULOUS GLANDS.—The infection of the various groups of cervical lymphatic glands by the tubercle bacillus is a very common affection, and one from which no age can claim immunity.

The pathological process represents the development of a tuberculous lesion in a singularly perfect manner, and, according to the mode of response which these tissues offer to the infecting agent, we are able to distinguish several grades of the disease.

It may be argued that the lymphatic glands, being peculiarly rich in low-formed cellular elements, are able to oppose a better resistance to the tubercle bacilli than is, for example, the kidney, with its more highly specialized epithelium; and it is undoubtedly true that the natural resistance of the patient in overcoming the tuberculous invasion is better exemplified in disease of the glands than of many other structures. At the same time it is more than doubtful if nature can ever effect a permanent cure; and there is every reason to believe that glands which have become caseous, and even calcified, retain within them a source of latent infection which in after years may be roused into activity. Possibly in the earlier stages, before caseation has been produced, the protective substances and phagocytic activity may destroy wholesale the pathogenic bacteria; but for the present it may be said that in the later stages the disease, though apparently inactive, must be dealt with surgically, lest a focus for future trouble be left untreated.

In this connection, the value of tuberculin in the treatment of the condition should be considered, for the effect of the vaccine inoculation, which is discussed later in this article, is simply to aid the natural process of repair.

When a focus of tuberculous infection has passed into the stage of caseation and calcification, although an apparent shrinkage may be noted, the exact pathological condition is a mass of necrotic cells surrounded by a fibrous or calcareous envelope. The bacilli remain embedded in this caseous cemetery, but the impervious surroundings which prevent their emigration prevent also the permeation of the protective substances from the blood-stream, and act as barriers to the passage of the leucocytes.

It will be clear then that while we may temporize with the early stages, and expect and receive valuable assistance from the 'tuberculin' vaccine, the later stages, when caseation and softening have supervened, are more insidious and dangerous than is recognized, and more out of the range of successful therapeutic inoculation.

Clinically, three main grades may be recognized, but these are simply stages of the same pathological process, and though in one form a single gland only appears to suffer, while in another a group of glands is attacked and a very large amount of periglandular inflammation occurs, both forms will require, as a rule, the same plan of treatment. The three grades, which will be considered as affording examples of the stages of the disease encountered clinically, are as follows :—

1. *The Single Gland.*—This gland, frequently situated opposite the angle of the jaw, becomes enlarged and swollen, and on casual examination appears to be the only one affected. A more careful investigation will often reveal a local source of irritation in the mouth, and in some instances a number of smaller but definitely palpable glands in the vicinity of the primary swelling. This grade of glandular enlargement tends to caseation and softening, and by spread of the infection may rapidly pass into the second stage.

2. *The General Enlargement of the various Groups of Lymphatic Glands.* (*a*) The submaxillary ; (*b*) The tonsillar ; (*c*) The concatenate chain ; (*d*) The para- and sub-trapezial glands of the posterior triangle. Any or all of these groups may be attacked, and this particular stage is the one most commonly met with.

3. *A stage where Fibrosis has occurred around the Caseous Centres,* when there is a great amount of peri-adenitis, matting the glands together and to surrounding structures. This stage is found in adults and old people when the resistance to the tuberculous invasion is well marked. Single glands rarely show this phase : it is commoner when larger groups have been affected, and a mass of great firmness and density is formed, which closely simulates a secondary carcinoma.

But while it is possible to classify cases under these main divisions, there are many other phases, especially of the second group. The appearance of these phases will depend upon many factors : (1) Upon the activity and virulence of the tubercle bacilli ; (2) Upon the general health and resistance of the patient ; (3) Upon the presence of a source of continual irritation ; (4) Upon the occurrence of a 'mixed infection'.

In very young children, especially in those who are ill-nourished, there is an early tendency to fusion and breaking down of the glands. In some adults, on the other hand, the process may be characterized by such chronicity in development, by such absence of peri-adenitis and fixation, that the cases appear clinically like those of benign lymphadenoma. It may not be out of place to point out that the exact status of benign lymphadenoma has not been clearly settled, and many cases which have been diagnosed as such have turned out later to be tuberculous.) (*See* LYMPHADENOMA.)

The subject of local irritation in respect to the development of tuberculous glands is an exceedingly important one, whether the region under discussion be the neck, thorax, abdomen, or thigh ; and it has been proved satisfactorily that in the vast majority of cases the incidence of a tuberculous process in a glandular group has been preceded by injurious irritation in some part of the region drained by those lymphatics.

In the region of the neck there are so many sources of possible irritation that the most thorough investigation must be undertaken in all cases before any radical treatment of the actual glandular affection is contemplated. The scalp must be examined for patches of seborrhœic eczema, for other lesions, and for pediculi. The mouth must be examined for carious teeth, the ear for any evidence of chronic suppuration, and the naso-pharynx and throat for adenoids and chronic tonsillitis.

The relative importance of these various sources of irritation differs according to the age of the patient. In children it is rare to find a carious tooth at the bottom of the trouble, but in them we find a fertile soil for the cultivation and dissemination of micro-organisms in the lymphoid masses and the enlarged tonsils which are so common at this age. Adults are rarely affected in this respect, but a carious molar, hitherto unrecognized as the source of the mischief, can often be found on careful examination.

While considerable attention has been directed to these accessory or predisposing causes of tuberculosis, very little has been said about the many adventitious microbes which find their way from these local lesions to the lymphatic glands ; and it would not be incorrect to state that, in the vast majority of cases of tuberculous glands, not only has a local irritative cause been responsible for the early enlargement of the glands, but organisms other than tubercle bacilli have entered the lymphatic circulation, so that the resulting infection is essentially 'mixed'. It is doubtful if this point has been sufficiently

emphasized, and as it is extremely important, both in prophylaxis and treatment, more attention should be directed to it. It should be clearly understood that the local lesion is 'irritative' not merely in a mechanical sense, but bacteriologically, and forms a source of bacterial infection, not by the tubercle bacillus alone, but by many other micro-organisms.

It has been possible, in a few cases, to isolate and distinguish these additional agents, but the great difficulty that attends their thorough recognition lies in the fact that many of them, especially some of the streptothrix group (an organism nearly always present in the mouth), cannot be cultivated.

It is now clear that the first essential in all cases of glandular enlargement is a thorough search for, and adequate treatment of, any local condition which may be considered a source of infection, and with this end in view enlarged tonsils and adenoids must be removed. Carious teeth must be extracted or filled. Eczematous conditions of the scalp must have special attention, and discharges from the ear must be carefully treated. Until all further infection has been prevented as far as possible, by the recognition and treatment of these various sources, no radical operation upon tuberculous glands is to be considered.

The treatment of tuberculous glands must be considered under :—

1. **General and Prophylactic Treatment.**—This will resolve itself into a careful consideration of the details mentioned in the previous paragraph, and the administration of cod-liver oil, iron, and malt—remedies which are of undoubted value in this as in other tuberculous conditions. The influence of fresh, and especially of seaside, air, as an adjunct to this treatment, must be duly appreciated.

2. **Operative and Immunizing Treatment.**—The particular operation to be performed in cases of glandular enlargement involves the consideration of the three groups of cases previously mentioned.

When a single gland is involved, or where at least the chief infection appears confined to that gland, this should be removed as soon as thorough treatment of any predisposing cause, such as a carious tooth, has failed to bring about a marked diminution in the glandular swelling. After the local lesion has been treated, iodine ointment should be applied to the skin over the swollen gland, and the patient should be watched. If this fails, the gland should be excised, for by this means the whole process may be arrested and the further involvement of adjacent groups prevented.

Should the gland soften and break down, a small incision should be made over it, the contents removed with a scoop, and the cavity swabbed out with pure carbolic acid ; a drainage tube should be inserted, and the wound be allowed to close gradually. There must be some difference of opinion as to when excision should be attempted and when scraping only should be tried ; but in general, when the skin over the swelling is red and when the mass is adherent, it will be wiser to deal with the abscess by scraping and drainage, since, if an attempt be made to remove the whole of the affected gland, there is great risk of wound infection. The small scar can be dissected out later when healing has taken place.

The treatment of the second variety will depend upon the condition of the glands. If, in the enlarged groups, there are several points where the glands are breaking down and are adherent to the skin, it is wiser to deal with them as advised above. Since in these cases there is nearly always a 'mixed infection', there is considerable risk in making an extensive dissection of the triangles of the neck. If the various abscesses be opened and drained, and general measures be taken to improve the resistance of the patient, a radical operation may become unnecessary, or at least be rendered much safer.

Where, however, large groups of glands are affected, or where contiguous chains have been attacked, no marked softening or suppuration having taken place, it may be advisable to undertake the radical operation. This is an operation of major surgery, and requires as much care and skill as any that the surgeon may be called upon to undertake : further, it is distinctly a dangerous one, since, apart from the risk of injuring important structures, the mixed infection which is present may give rise to serious, even fatal, complications, a virulent form of septicæmia sometimes supervening.

The actual extent to which the dissection is carried will depend upon the needs of the case, but the same general principles should be observed in dealing with the

localized groups of enlarged glands as in the more extensive cases which alone will be described.

Incision.—Either a curved incision following the lines of natural cleavage of the skin, as recommended by Kocher, passing from the mastoid region to the middle line in front below the jaw, may be made, or an oblique incision in front of or behind the sterno-mastoid. There is little doubt that the 'collar' incision of Kocher, which can be employed in the lower as well as the upper part of the neck, leaves a less conspicuous scar than the commonly employed oblique incision. At the same time, the latter gives a better exposure of the parts, and if care be taken to suture the investing layer of cervical fascia and platysma as well as the skin, the scar will not stretch to any great extent.

The incision should always be a free one, and it is much better to err on the side of a long, than of a short, incision in this dangerous region. When the incision has been made, the dissection should be begun from below, the surgeon gradually working upwards until the uppermost gland, usually the tonsillar or jugulodigastric, is reached. This gland lies deeply, in relation to the posterior belly of the digastric, the jugular vein, the spinal accessory nerve, and the transverse process of the atlas. It drains the tonsil, is usually the first gland to be infected, and some difficulty attends its removal. The dissection must be systematic, all the lymphatic glands, fat, and intervening cellular tissue being removed until the anterior and posterior triangles are completely bared. Much stress must be laid on this detail, for it is usually futile simply to remove those glands which are obviously enlarged, leaving countless small infected masses lurking behind in the fatty cellular tissue. A recurrence of the trouble after an extensive operation is a disappointment to all concerned, and it is best prevented by a thorough dissection.

From the moment the incision has been deepened through the fascia colli, four structures claim the greatest attention from the surgeon, according to the position of the mass of glands that has to be removed: (1) The spinal accessory nerve; (2) The internal jugular vein; (3) The facial nerve; (4) The thoracic and right lymphatic ducts. Many other important structures are exposed, but are less likely to be injured.

1. *The Spinal Accessory Nerve* is met with in both triangles. In the posterior it crosses from the middle of the posterior border of the sternomastoid obliquely to the lower third of the anterior border of the trapezius. In the anterior triangle it will be found passing round the prominent transverse process of the atlas and entering the deep surface of the sternomastoid, in an adult, 1½ inches below the tip of the mastoid process. If, in a patient of any age, a line be drawn between the angle of the jaw and the tip of the mastoid, and another line at right angles to the centre of this, passing obliquely across the sternomastoid and cutting the middle of the posterior border of the muscle, and if this line be prolonged across the region of the posterior triangle to the trapezius, a very fair idea will be gained of the course the nerve pursues, and it is advisable for the surgeon to keep this in mind during his dissection. Unfortunately the nerve is intimately connected with the affected glands, and in some cases is displaced from its normal line, but it may be remembered that when the chief mass of glands lies below the middle of the posterior triangle, the nerve will be displaced upwards; conversely, when the mass is in the upper part, it will be displaced downwards. When the region of the nerve is reached, blunt dissection must be employed, and every band must be tested for motor nerve fibres. Fortunately, the slightest stimulus from the director or blunt dissector will cause a contraction of the trapezius, and in this way the nerve may be isolated. In spite of the fact that the nerve appears to be embedded in the glandular mass, it is nearly always possible to free it completely without damage. The same rules apply to the nerve in the anterior triangle, but its greater depth renders the dissection more difficult. Should the nerve be accidentally divided, the ends must be sutured.

2. *The Internal Jugular Vein* is in evidence in most operations on enlarged cervical glands. In the majority of cases it is easy to clear away the glands of the concatenate chain which lies along it, for the vein, though naturally very thin, becomes thickened by the pressure of the glandular mass. During the dissection the vein may be wounded, or small branches torn from their point of attachment to the vein wall. Neither accident is serious if properly treated. The opening must be picked up accurately with artery forceps, and a ligature must be applied very tightly, so that the opening is satisfactorily

closed. The vein wall is very elastic, and several points may be tied in this manner without the smallest ill effect.

Serious injury to the vein is best avoided by clearly exposing it in the early stages of the dissection. In cases where the vein is so matted to the mass of glands that it cannot be removed without serious damage to its walls, a double ligature must be placed on the vein below the mass, and the vessel must be divided in this position. The lower end is allowed to drop back into the wound, but the upper end, together with the mass of glands, is dissected up until the mastoid process is reached. Another ligature is now placed on the extreme upper part of the vein, and the vein and glands removed *en masse* below this ligature. Although no serious consequences arise from ligature or removal of the vein, it must be preserved if possible.

Wounds in the upper part of the vein require further mention. Lying deeply beneath the mastoid process and in relation to the tonsillar gland, an injury to it is of more serious consequence here than lower down. The sudden flooding of the wound with a quantity of blood is sufficiently alarming, and added to this there is the difficulty that will be experienced in applying forceps or a ligature. Should this accident occur, the wounded vein must be immediately plugged with the finger or with gauze packing, and all excess of blood must be mopped up ; then a pair of large artery forceps must be passed along the controlling finger and an attempt must be made to grasp the opening. Sometimes this results in an increase in the rent, and if this be the case, or if it be found impossible to apply a ligature, gauze plugging must be carefully packed on to the vein, in an upward direction, so as to control the supply of blood coming from the cranial cavity.

Although bleeding furiously and alarmingly when injured, the internal jugular is a cowardly vein, and bleeding can at once be arrested by judicious plugging. The plugging should be changed in forty-eight hours, a smaller strip being inserted ; but if the removal causes fresh bleeding, a strip similar in size to the original must be used.

Another accident which may result from injury to the internal jugular is the entry of air into the veins. Fortunately this is of very rare occurrence, and can be prevented by prompt treatment of the wounded vessel.

3. *Injury to the Facial Nerve* or its main trunks is most unlikely to occur, since the nerve lies so deeply in the parotid ; one branch, however, may be damaged : this is the ' ramus anastomoticus ', the lowest branch of the cervicofacial division, which runs below the body of the lower jaw to innervate the platysma and the risorius, and to communicate with the transverse cervical nerve in the neck. If the curved incision be made too near the mandibular margin, this nerve is divided, and some weakness of the angle of the mouth will result. The skin incision should lie at least one inch from the lower border of the jaw.

4. *The Position of the large Lymphatic Trunks* in the lower part of the neck must be remembered. They are most likely to be injured when the dissection is being carried out over the lower part of the scalenus anticus muscle. The thoracic duct looks like a vein, so great care must be taken of all deep veins in this region. Should it be injured, an attempt may be made to suture it.

After the dissection has been completed, and all vessels have been secured, the wound is closed. It is advisable to employ separate sutures of catgut to bring the edges of the incision in the deep fascia together. A drainage tube should be employed for twenty-four to forty-eight hours.

After-treatment consists in keeping the patient absolutely still in bed until primary union has occurred (for ten to twelve days). Sand-bags should be placed on either side of the head, or, better still, a poroplastic splint should be fitted on over the dressings.

The treatment of cases which fall under the third group is conducted on the same main lines. In most instances, owing to the firm matting of the glands to the surrounding tissues by the peri-adenitis, it will be inadvisable to attempt more than the extirpation of the central caseous areas, after the manner previously described. Occasionally some radical operation may be indicated, but this must be left to the discretion of the surgeon.

The keloid form of scar which often develops at the site of a tuberculous sinus, or in the line of an incision for the removal of these glands, will be found to yield rapidly to the influence of tuberculin.

Vaccine Treatment.—No account of the treatment of a tuberculous lesion would be complete without reference to the tuberculin treatment introduced by Sir A. E. Wright. Undoubtedly it is of benefit, and in many cases produces marked amelioration, even subsidence, of the glandular swellings, but whether it is destined to remove these cases from the hands of the surgeon entirely is a matter of doubt, at least for the surgeon. Owing to the fact that in most cases the infection is mixed, the tuberculin treatment will fail to bring about complete resolution, and although it is possible to vaccinate successfully against many other organisms, the infecting agent in these cases cannot always be cultivated, as has already been pointed out. Again, it is generally conceded that when softening and suppuration have occurred, the vaccine treatment will be unsuccessful.

On the whole, the position at present with regard to the vaccine treatment is this: as a preliminary to surgical treatment it should, when possible, be employed. If the case fails to benefit from it, or if caseation and softening of the glands occur, one of the operations described above is to be recommended. *W. H. Clayton-Greene.*

TUMOURS, INTRACRANIAL.—(*See* INTRACRANIAL TUMOURS.)

TUMOURS OF THE JAWS.—(*See* JAW, TUMOURS OF.)

TUMOURS, SPINAL.—(*See* SPINAL TUMOURS.)

TYPHLITIS.—(*See* APPENDICITIS.)

TYPHOID FEVER.—(*See* ENTERIC FEVER.)

TYPHUS FEVER.—It is most essential that abundance of fresh air should be allowed to circulate freely round the patient. If this condition be fulfilled, not only will the disease progress more favourably than if there is a want of ventilation, but those in attendance upon the patient will be less likely to catch the infection.

For the most part the general directions as to treatment given in the articles FEVERS, ACUTE INFECTIOUS, and ENTERIC FEVER, will apply to typhus. But it is not necessary to be quite so careful about the diet in typhus as in typhoid fever.

Hypostatic pneumonia is common during the second week; to avoid it, the patient should not be allowed to be too long in one position.

During the end of the first and the beginning of the second week of the disease, the delirious patient requires constant watching; he may be noisy and even maniacal, and will have to be prevented from getting out of bed. A patient may have strong delusions, on which he may act, without being delirious.

Stimulation is frequently called for towards the end of the second week.

In severe attacks, the patient should not be allowed to sit up, even in bed, too soon after the crisis, for muscular and cardiac weakness are usually pronounced. Moreover, complications, especially affecting the lungs, may arise during the early days of convalescence.

The patient may be considered to be free from infection four weeks from the beginning of the illness.

Quarantine period: three weeks. *E. W. Goodall.*

ULCERS.

GENERAL TREATMENT.—Ulcers are wounds which are slow in healing, as the result of either constitutional disorders—diabetes, albuminuria, anæmia, etc.—or of imperfect local treatment. The first essential in the treatment is to deal with the constitutional disease as far as possible, so that the tissues may the better respond to local surgical measures. When grave constitutional disturbance is present, no active operative treatment should be undertaken.

LOCAL TREATMENT will consist in encouraging a healthy reaction, so that fresh, active granulations may form which can be covered either by the natural growth of the epithelium at the periphery, or by skin-grafts transplanted on to the surface. When once an ulcer has become healthy, and shows signs of active healing, all that is necessary is to protect the part from undue pressure or irritation, and to facilitate the growth of epithelium.

For this purpose nothing is better than strips of green protective, perforated to allow the discharge from the granulating surface to escape, the whole area being subsequently covered by an antiseptic gauze dressing. The gentle pressure of the protective keeps the granulations flat and allows the epithelium to grow unchecked and uninjured over the surface of the ulcer. The limb should, when possible, be kept at rest until healing has taken place. In any case of ulcer, the venous return from the parts should be assisted as much as possible, either by the position of the limb, or by firmly bandaging from its extremity to a point well above the situation of the lesions. Certain kinds of ulcers, however, will require special treatment.

The Inflamed Ulcer is one in which an active infective process is at work, causing increasing destruction of the tissue, and acute inflammatory phenomena. It arises in old neglected ulcers which have been contaminated by dirty dressings. The patient should go to bed, and the leg should be elevated and dressed with moist antiseptic gauze or carbolic acid fomentations. If the surface is not a large one, it should be painted with a solution of strong carbolic acid. A careful watch must be kept for a spreading cellulitis.

The Callous Ulcer is one the edges of which are everted and indurated, and the base covered with small unhealthy granulations. There is usually a considerable amount of matting together of the surrounding tissues, and sometimes in long-standing cases the ulcer is adherent to the bone. In order to procure healing, it will be necessary to stimulate the callous surface, either by applying blisters to the edges and margins of the ulcer, or by scraping away the everted, indurated margin. In addition, it is often advisable to incise the tissues deeply, about one inch from the margin of the sore, so that contraction may take place. If such ulcers are thoroughly scraped and carefully dressed, or if the limb be kept at rest and elevated, they will soon become healthy. Skin-grafting may be required in the later stages. Calcium iodide in 3-gr. doses thrice daily has been stated to give marvellous results in cases of chronic ulcer. It may be used in conjunction with any of the above methods of treatment.

The Anæmic Ulcer is a weak, avascular condition which occurs in anæmic women. There is no thickening as in the callous variety, but there is no attempt at healing. The administration of iron by the mouth, and the application of stimulating dressings—lotio rubra, Unna's plaster, or Friar's balsam—will give satisfactory results.

The Irritable Ulcer is a painful condition due to the exposure of an inflamed nerve filament in the base of the ulcer. The point of tenderness should be accurately localized, and the nerve-fibres divided a little distance above the ulcer or the tender point. Subsequently the ordinary treatment should be undertaken.

The Varicose Ulcer is the common variety seen in the out-patient department. It is very difficult to treat unless the patient will consent to remain in bed. If the so-called ambulatory treatment be adopted, a certain number will heal slowly. This consists in 'strapping' the ulcer with Unna's gelatin bandage, which supports the limb and prevents it swelling. The objection to this treatment is that the dressing has to be frequently renewed when the discharge is copious. Another method is to encourage a healthy reaction by stimulating lotions or ointments—the cyanide of mercury ointment is an excellent application—and to bandage the limb from below upwards with a crêpe Velpeau bandage: this should be put on first thing in the morning before the foot begins to swell, and the patient should walk or stand as little as possible. In some cases benefit will result from excision of the dilated veins.

Varicose ulcers are liable to bleed when the destructive process has attacked one of the dilated veins. Properly treated this is not a serious matter, but neglect or carelessness may lead to fatal results. A firm antiseptic dressing should be applied over the bleeding ulcer, and the limb should be carefully bandaged from below upwards. The patient should be confined to bed until the ulcer shows signs of healing, and the limb should be elevated above the level of the trunk.

The Perforating Ulcer is a destructive condition of the tissues arising from suppuration in a bursa beneath a callosity or corn. The suppuration tracks into the joints and may burrow for a considerable distance into the sole of the foot. It is usually associated with tabes dorsalis, but occurs in other conditions. The ulcer should first be cleaned by moist antiseptic dressings, fomentations, or baths, and all the thickened epidermis should

be cut away. If the sinus is unhealthy it should be scraped. The cavity should be plugged with gauze soaked in lotio rubra or Friar's balsam, and the track should be allowed to close from the bottom. During treatment the patient should not walk on the affected foot.

The Phagedænic Ulcer is an acute destructive process, occurring in alcoholics or diabetic patients. It may or may not be associated with syphilis. In appearance the ulcer resembles the inflamed variety, but the process is more acute, the tissue destruction and sloughing are more extensive, and the constitutional symptoms are more severe. The ulcer should be cleaned with peroxide of hydrogen, all sloughs should be cut away, and the surface may be swabbed over with strong carbolic acid. After this preliminary treatment the limb should be placed in a bath, or constant irrigation should be employed. Stimulants and tonics will be required, and the general treatment should be as in cellulitis (*see* ERYSIPELAS). In the later stages of healing, care must be taken that undue contraction does not interfere with the function of the limb (*see also* BURNS). Exuberant granulations should be touched with silver nitrate.

Among recent applications for chronic ulcers should be mentioned scarlet-red ointment, decoction of comfrey, and horse serum. The first two are cell-proliferants, stimulating epithelial growth, and are certainly of value; the third method is still on trial.

The method of exposing ulcers to a current of oxygen has given very satisfactory results, and is to be recommended. The gas is allowed to play on the surface of the ulcer for periods varying from ten to twenty minutes, after which a dressing is applied in the ordinary way. *W. H. Clayton-Greene.*

UNDULANT FEVER.—In the majority of cases the disease is acquired from drinking goats' milk, as many goats are infected with the *M. melitensis*. For prophylaxis, in any place where undulant fever occurs, all milk used must be well boiled, or—and better—tinned milk only should be used. Treatment here is essentially symptomatic. Quinine, salicylates, and antipyretics are often used, but have no action beyond temporary relief of the symptoms in some instances, and as the disease runs a most protracted course, the use of such drugs cannot be persisted in. Vaccine treatment has given varied results, but in some (mild) cases has been beneficial.

Diet must be light and nutritious; solid food often appears to cause or precipitate a relapse. Constipation has a similar effect.

The temperature is best reduced by local applications, sponging, etc., and, if hyperpyrexia threaten, by the use of cold baths. The joint affections may be relieved by local applications. The occasional use of hypnotics may be necessary. *C. W. Daniels.*

URÆMIA, RENAL TOXÆMIA (Acute and Chronic).—Uræmia is commonly described as occurring in two forms. In the one the symptoms are of acute onset, of great severity, and of grave prognostic significance. In the other they are of gradual onset, of less apparent severity, and of very indefinite character. They are often called, respectively, acute and chronic uræmia. The two groups stand in such strong clinical contrast to each other that it would be well if different names were employed to designate them. For the acute cases 'acute uræmia' might be retained; for the chronic, 'chronic renal toxæmia' might be a better term.

By **Chronic Uræmia,** or **Chronic Renal Toxæmia,** is meant that gradual failure of health and nutrition, with the various and often indefinite symptoms, which is met with especially in the later stages of granular kidney, but in some degree also in the later stages of chronic parenchymatous nephritis. The condition has already been dealt with and its treatment discussed in the article on NEPHRITIS, CHRONIC.

Acute Uræmia.—From both the above conditions acute uræmia is clinically distinct. The great characteristic is the suddenness with which the symptoms arise. Without any warning the patient is seized with twitchings, which rapidly develop into violent epileptiform convulsions. The patient becomes unconscious, and dies within a few hours unless the fits cease.

If acute uræmia threaten, still more if it have already developed, active measures are imperative.

The patient should be put into a *hot bath*, or, if too ill for this, should have a *vapour* or *hot-air bath*, or be *packed*. At the same time *diaphoretic remedies* should be given; but if the symptoms are very urgent, *nitrate of pilocarpine* should be administered by subcutaneous injection; $\frac{1}{6}$-gr. dose is sufficient at a time, repeated as required at intervals of an hour. Some brandy or gin and citrate of caffeine may be given to obviate any depression which might be produced by the drug, though these doses are, as a rule, borne without detriment.

The bowels should be relieved by some rapidly acting purge, of which *elaterium* is the best, in the form of the pulv. elaterini co. (1 to 4 gr.), aided, if necessary, by an enema, or 1 drachm of pulv. jalapæ co. may be given and followed by a saline purge six hours later.

If the tension be high, *nitroglycerin* or the *nitrites* might be given, but this is best reduced by the other measures employed. If the fits are very severe, a whiff or two of *chloroform* has been advocated, but it should not be used unless it cannot be avoided. The *bromides* and *chloral* are too slow in their action, and are fitted rather for restlessness and sleeplessness, for which *morphine* also may be given, and without the risks formerly attributed to it.

Should the fits persist, the question of *bleeding* will arise, with the object of removing the poison. To do any good the bleeding must be free, and 10 to 20 oz. of blood removed. This is in many cases followed by immediate improvement; but the loss of so much blood necessarily leaves the patient very feeble, and where asthenia has been a prominent feature of the case, it is obviously to be used only as a last resource.

With the two objects of diluting the poison and promoting its elimination, *hypodermoclysis* has been employed, that is, considerable quantities of water or weak saline solution have been injected sub cutem. This is a measure which is impossible with acute or chronic parenchymatous nephritis, where the patients are œdematous, but is not irrational in cases of granular kidney, where there is little or no œdema.

Another method recently advocated is *lumbar puncture*, or *lumbar drainage*. Improvement has been said to follow this operation in certain cases.

The continuous *inhalation of oxygen* for some hours seems on the whole, in these urgent cases, to yield the best results. Under its influence the intolerable restlessness often subsides, and the patient falls asleep; and even the fits seem to be reduced in severity. Its administration must be persisted in continuously, or almost continuously, for some hours. To give it for ten or fifteen minutes only every hour or so is practically useless. The inhalation of oxygen has this further advantage, that it can be combined with any of the other methods of treatment.

Whatever form acute uræmia may take, the prognosis is grave. If any one of the forms has a less serious significance than another, it is, strange as it may seem, that in which epileptiform convulsions occur.

Samuel West.
(Revised by R. Hutchison.)

URETHRA, RUPTURE OF.—Rupture of the urethra may occur with laceration of other viscera in severe injuries of the pelvis, or it may be the solitary lesion produced by violence applied to the perineum. Only the latter class need be considered here. Laceration of the urethra may be produced by the unskilful passage of instruments (*see* URETHRAL STRICTURE), or by injury from without, such as falls astride a beam, or kicks or blows on the perineum.

The history of an injury to the perineum should always be the signal for a careful examination of the urethra, whether signs of laceration to this tube be present or not. The signs of rupture of the urethra are the appearance of blood at the meatus apart from micturition, and the presence of a tender swelling at the injured area. Retention of urine frequently accompanies these signs.

A patient seen after such an accident before he has attempted micturition, should be prevented from passing urine, and an immediate attempt made by catheter to ascertain the extent of the injury to the urethra. With the utmost gentleness a large-sized metal catheter is passed down to the point of injury, and it should be guided along the roof of the canal, for this is the portion of the urethral wall that is most likely to escape injury. If on gentle manipulation the catheter passes onwards smoothly, and the position of the instrument, the freedom of its beak, and the flow of urine show that it has entered the bladder, the laceration has affected only part of the wall of the urethra.

If the rupture is situated in the penile urethra, a silk-wove or rubber catheter should be fixed in position and retained for three or four days, the urethra being washed alongside it daily. The passage of metal instruments should be commenced in a fortnight, and continued regularly to prevent the development of a stricture.

If the rupture is in the bulbous urethra, or behind this, an operation should be performed as soon as possible. If the catheter has been successfully passed, it is retained until the operation can be carried out. If the catheter cannot be passed, the urethra is probably completely severed, and no prolonged attempt to enter the bladder should be made. If the bladder is distended, and immediate operation is impracticable, the urine should be withdrawn by suprapubic puncture, rather than allow it to be passed into the perineal tissues by attempts at micturition.

At the operation the patient is placed in the lithotomy position and the perineal hæmatoma incised. If the rupture lies in the bulbous urethra, a median incision should be made, but if the rupture is situated deeply in the membranous urethra, a curved transverse prerectal incision will give the best exposure. The clots are turned out and a stream of hot lotion from an irrigator is directed into the wound to stop oozing. It the urethra has not been completely severed there is no difficulty in finding the torn edges, and a catheter is passed along the penile urethra and guided into the bladder. The edges of the ruptured urethra are trimmed and united as accurately as possible with catgut sutures. The bladder is now distended with fluid through the catheter, and the patient placed in the horizontal position. The bladder is opened above the pubes, and a large rubber drain introduced. The catheter is now removed and the perineal wound closed round a rubber drain.

If the urethra has been completely severed, a search is made for the vesical end, which may be found as a loose shred of tissue, or may resemble the twisted end of a large blood-vessel, or may be identified by the persistent bleeding of a small vessel in its wall; suprapubic pressure may cause some urine to trickle from the urethral stump. If the search is successful, the ends are united with catgut sutures over a gum-elastic catheter and the perineum sutured in layers. Suprapubic drainage is then established.

Should the search for the vesical end of the urethra prove fruitless, suprapubic cystotomy should be performed and a bougie passed along the urethra. The vesical end is identified, and the operation completed as before.

Should the patient have already attempted micturition, and catheterization have failed, the position is less favourable for the discovery and union of the separated ends of the urethra. In such a case the search may prove unavailing, and the practitioner will have to content himself with free incision of the swollen tissues, and the insertion of large drainage tubes.

The patient should be supported by stimulants, such as alcohol by the mouth, and strychnine subcutaneously. Urinary antiseptics, such as hexamine (10 gr.) and boracic acid (15 gr.), should be given after the operation.

Suppression of urine occurs in some cases, and is treated in the same manner as when due to other causes (*see* URINE, SUPPRESSION OF).

The patient should be warned of the stricture which will inevitably follow the lesion, and the passage of instruments should be commenced a few weeks after the rupture.

J. W. Thomson Walker.

URETHRAL CARUNCLE.—If the treatment of a urethral caruncle is not thorough, the condition is almost certain to recur. Cauterization without an anæsthetic is useless, as it cannot be done efficiently. Removal of only the growth itself, by either knife or cautery, is insufficient treatment. A small portion of the posterior wall of the urethra, to which the base of the caruncle is attached, must be removed as well, otherwise the caruncle will probably recur. The growth should be dealt with by a wedge-shaped incision which removes the whole of its base, the resulting wound being closed by the insertion of two or three catgut sutures. If there is free bleeding, the sutures may be inserted on one side of the incision before the cut is made on the other side; then the suture can be completed after removal of the growth without the fear of landmarks being obscured. While the sutures are being inserted and tied, it is well to place a catheter in position, lest the urethral orifice should be too much narrowed. If the cautery is used

instead of scalpel and sutures, care must be taken that none of the tissue round the meatus is burnt; otherwise the patient may complain of pain for several days. After suture there is usually very little, if any, pain. *H. Russell Andrews.*

URETHRAL STRICTURE.—(1) A diagnosis of stricture having been made, the treatment consists in dilatation by means of instruments. (2) Certain complications may arise during this treatment which require special consideration. (3) Some cases of stricture are not suitable for dilatation, and a cutting operation is required.

1. **Treatment of Stricture by Dilatation.**—Metal bougies or flexible bougies of silk or cotton web coated with certain preparations are used.

Metal instruments may have a conical or, better, a bulbous end. The graduation varies slightly with the individual instrument-maker, and the instruments bear two numbers, which show the size at the tip and at the thickest portion of the shaft. Metal instruments have the following advantages: they withstand boiling, and last for many years; they have a smooth, highly-polished surface, that is easily kept surgically clean. They are specially useful in certain tortuous strictures, in cartilaginous strictures, and in strictures that have been dilated up to a large size and still require the occasional passage of an instrument. In the lower sizes they readily injure the urethral mucous membrane, and should be handled with the greatest caution. When not in use they should be smeared with vaseline before being laid aside. They should be re-plated on the first sign of cracking or scaling of the nickel.

Gum-elastic instruments or bougies should be pliable and resilient. A good bougie tapers gradually to a bulbous or olivary tip, and presents no abrupt shoulder. The shaft should be stiff, but the half of the instrument next the tip should bend readily to the touch. Whalebone bougies are dangerous instruments and should not be used. Bougies are graduated according to French scale, which indicates the circumference in millimetres, or to an English scale similar to that used for metal instruments.

The French bougies possess the advantage of an exact and constant measure, and they ascend by finer gradations of size (roughly 3 F. to 2 E.). The finer woven instruments made in England are as well shaped and durable as the French, but the less expensive bougies are much inferior.

Pliable bougies are not so likely to damage the urethral mucous membrane as metal instruments. They are especially useful in the smaller sizes, and are preferable for the dilatation of most strictures up to 21 or 22 F. size. Beyond this size they are stiff and unwieldy, and are better replaced by steel instruments.

The most useful sizes of bougie are from 10 to 16 F., but one or two filiform bougies are a necessary part of the surgeon's outfit. The following numbers will be found useful when selecting bougies: two filiform bougies, and numbers 6, 10, 12, 14, 16, 18, and 20 of the French scale.

There are three essentials to the satisfactory passage of an instrument in a case of stricture of the urethra: the instrument must be aseptic, must be well lubricated, and must be used with a gentle hand.

Metal instruments are prepared by boiling for ten or fifteen minutes in a super-saturated solution of ammonium sulphate. Elastic bougies may be plunged into boiling water and then placed in cold biniodide solution (1–4000), care being taken to remove the antiseptic before using the instrument. After use these instruments should be washed in running water, the oil being entirely removed, then be swabbed with a solution of perchloride of mercury or carbolic, and carefully dried. They are kept in a glass tube or an enamelled metal box with a little lycopodium powder.

The efficient oiling of the instrument is of the utmost importance. Olive oil, liquid paraffin (paroleine), liquid vaseline, or one of the following formulæ may be used as a lubricant for urethral instruments:—

℞	Phenolis	1 part	Olei Amygdalæ	8 parts
	Olei Ricini	7 parts		
℞	Cocainæ Hydrochloridi	gr. v	Olei Ricini	
	Olei Eucalypti	℥x	Olei Olivæ	āā ʒss
℞	Hydrargyri Oxycyanidi	gr. iiiss	Tragacanthæ	gr. xlvj
	Glycerini	ʒvss	Aquæ Dest. Sterilizatæ	q.s. ad ʒiij

A ready method of use is nearly to fill a tall narrow beaker with biniodide solution (1–4000) and pour into it several teaspoonfuls of boiled olive oil or paroleine, which will float to the top. The instrument is placed in the jar while the patient is being prepared, and is lubricated by the floating oil as it is withdrawn.

The third essential is a delicate touch. The want of this accounts for most of the accidents which result from the passage of urethral instruments.

The method of passing instruments is as follows: The surgeon stands upon the left side of the recumbent patient, and handles the instrument with his right hand while he manipulates the penis with his left. In the introduction of a steel instrument, the penis is grasped behind the glans by the thumb and forefinger of the left hand, and the tip of the instrument inserted into the meatus, while the shaft of the instrument lies transversely across the left Scarpa's triangle. The handle of the instrument is now carried gently towards the patient's abdomen and onwards to the middle line, and gradually raised meanwhile, so that the point drops downwards and backwards. During this manœuvre the left forefinger and thumb draw the penis upon the instrument. The handle is lightly held between the right forefinger and thumb, and the slightest hitch receives instant attention. If the instrument is stopped at the stricture, a smaller is tried, until one is found that will pass. As the point passes down to the bulbous urethra, the left hand leaves the penis, and the fingers are used to support the perineum. The point of the instrument passes into the membranous urethra as the handle becomes vertical and swings downwards, and the left forefinger and thumb replace the right, while the handle is gently depressed between the thighs and pushed onwards.

In passing elastic bougies, it must be remembered that the operator has little power for changing the direction of the point of the instrument, and the passage of the bougie into the membranous urethra depends upon its pliability. The penis is grasped behind the glans by the thumb and forefinger of the left hand, and the penis kept on the stretch to render the urethra straight and obliterate the folds in its walls. The bougie is introduced and lightly held by the corresponding digits of the right hand. If the instrument engages in the stricture, it is pushed gently onwards. If the point is arrested, it is withdrawn a little and again pushed on. If the attempt fails, a smaller instrument should be selected, and so on until the size that will pass is reached. If, on the other hand, the bougie first passed lies loose in the stricture, a larger instrument is passed, until the size is reached which is lightly gripped by the stricture. This 'fitting' a stricture with an instrument must be distinguished from dilatation of the stricture.

In attempting to pass an instrument through a small stricture, filiform bougies are employed. They should not be resorted to until the operator is satisfied that he is really dealing with a small stricture, for the point of a filiform bougie readily catches in any fold of mucous membrane, and for this reason may fail to pass where a stricture of comparatively wide calibre is present, or where the obstruction is spasmodic in character. If the filiform bougie fail to pass, it is withdrawn and gently advanced again. On further failure, the tip of the instrument is bent to an angle and the bougie again introduced. The face of the stricture is now searched by turning the bougie round and testing the different parts of the circumference. If this manœuvre fail, it should be repeated with another filiform bougie. A syringeful of oil may be injected into the urethra and the meatus gripped with finger and thumb to retain the oil, while at the same time the searching of the face of the stricture with the filiform bougie is continued. If this is unsuccessful, a number of filiform bougies should be passed into the urethra, and they will engage in any pockets or false passages. By trying each bougie separately, one of them may pass on through the narrow opening.

It is sometimes of assistance to pass a large bougie down to the face of a stricture, and after withdrawing it to pass a filiform. In this way the opening of the stricture may be centred, and obstructing folds of mucous membrane pushed aside. If these attempts fail, and no retention is present, the patient should be replaced in bed and a brisk purge administered. A further trial should be made next day, and will usually be successful. An instrument sometimes passes readily when the patient is under an anæsthetic, when all other methods have failed.

When several strictures are present, a bougie smaller than will fit the anterior strictures will be required to negotiate the second narrowing, for if the instrument accurately

fits the first stricture, it can only be pushed straight onwards without in the least altering the direction of the point. A stricture which lies immediately in front of the membranous opening of the urethra will give rise to difficulty in the passage of instruments, for the membranous opening is on the roof of the bulbous urethra, and the bougie impinges upon the floor of the canal, which rises up towards this opening. In these cases it is often necessary to resort to a rigid metal instrument, the point of which is more easily guided into the membranous opening.

Routine Treatment of Stricture.—The majority of strictures of the urethra are amenable to dilatation by instruments. Dilatation is carried out in three ways: (*a*) As intermittent dilatation; (*b*) As rapid dilatation; (*c*) As continuous dilatation.

Intermittent dilatation is the best method of treatment of the majority of strictures, and is carried out in the following manner. The diagnosis of stricture by the passage of a bougie of large size (say No. 20 F.) down to the stricture having been made, the next step is to 'fit' the stricture with its proper size of bougie. A much smaller instrument is at once tried (say No. 10 F.), and if this fails to pass, successively smaller numbers are used, resorting at length, perhaps, to a filiform.

When a bougie that passes is found, it may lie loosely in the stricture, and if so a larger size is passed until the proper size is reached, which passes but can be felt to fit the stricture. This size is noted, no attempt being made to dilate the stricture by passing larger instruments. An interval of four to six days is now allowed, and the size which fitted the stricture is again passed, followed by the next larger size in the scale, and this is repeated after a similar interval. The scale is thus gradually ascended until the size of the stricture has reached 21 or 22 F. Above this size the gum-elastic bougies become too rigid and difficult to guide, and steel instruments should be employed.

During the ascent of the scale, the interval between the instrumentation should be extended gradually. At 14 F. a week may intervene, at 18 F. a fortnight, at 20 F. three weeks, and with the larger steel bougies (12–14, 13–15, 14–16) a month should elapse. If all goes well this will be extended to two months, three months, and finally the patient will call once in six months or once a year to have an instrument passed.

No absolute rule can be laid down as to the largest size to which the urethra should be dilated. The natural size of the canal varies in different individuals. If necessary, the meatus should be incised in order to let large-sized bougies pass. In most individuals the urethra should admit a bougie of 22 F. calibre, and it is advisable to dilate a stricture beyond this if possible.

The urethra should be syringed before and after the passage of the bougie with a weak solution of permanganate of zinc (1–5000) or of silver nitrate (1–10,000).

During the dilatation, and especially during the earlier part of the treatment, urinary antiseptics should be administered. Hexamine (5 gr. thrice daily), hetralin (7 gr.), helmitol (7 gr.), and boric acid (10 gr.), are among the best of these. The following prescription may be found useful:—

℞ Hexaminæ	gr. v	Syrupi Aurantii	℥xx
Acidi Borici		Infusi Buchu (B.P.)	q.s. ad ℥j
Ammonii Benzoatis	āā gr. x		

To be taken thrice daily.

When the intervals between the passage of instruments is prolonged to a month, the patient may take these medicines for two days before and two days after the operation. A slight gleet often accompanies stricture, and should be treated by the patient using an injection night and morning with a hand syringe. Permanganate of zinc, ½ gr. to the ounce, or sulphocarbolate of zinc in the strength of 1 per cent, is a suitable injection. The dilatation of the stricture will remove the principal cause of the discharge. The time taken for the treatment varies according to the behaviour of the stricture. At the end of three months the patient may be in a position such that a large steel is passed once in two months. It is seldom that a case can be dismissed before the end of six months or a year. Some patients, especially those belonging to the hospital class, are careless and irregular in their attendance, and after a time the stricture gets into a callous condition which is beyond the hope of complete cure.

Strictures which have not become tough and leathery from long duration, irregular

treatment, and prolonged irritation from chronic inflammation, will be cured by this means. A few of these relapse after a year or two, and require an instrument at long intervals; hard, tough, leathery strictures of long standing will not be cured by this treatment.

In cases where the patient gives a history of dribbling, where the clothes are saturated and the prepuce sodden with the leakage, the surgeon should at once resort to filiform bougies, for the stricture is of very small calibre. Where a filiform bougie is the largest instrument that will pass, we have to deal with either a very narrow stricture, or a moderate-sized stricture in which congestion or spasm is superadded. After a brisk saline purge and confinement to bed for two days, spasm or congestion will have subsided, and a bougie of moderate size (10 to 12 F.) will pass, and intermittent dilatation may be commenced. On the other hand, the stricture may still grasp a filiform bougie, and a choice of the following methods is open: rapid dilatation, continuous dilatation, a further attempt at intermittent dilatation, or a cutting operation. Rapid dilatation is to be condemned: it means rupture of the stricture and a more dense scar at a later date. Continuous dilatation is useful in these cases. The patient is kept in bed, and the filiform bougie which was passed after so much difficulty is fastened in by tying a silk ligature round it and fixing the ends to the sides of the penis by means of strapping. The urine trickles alongside the bougie. After twelve hours a slightly larger instrument can be substituted, and after twenty-four hours a 6 or 7 F. can be passed. The continuous dilatation is now abandoned and intermittent dilatation commenced.

It is not always possible to have the patient in bed for the passage of urethral instruments, but it is essential during the earlier operations until the surgeon is familiar with the 'temper' of the stricture with which he has to deal.

2. **Complications of Dilatation.**—When blood appears at the meatus, the mucous lining of the urethra is torn, and a peculiar sensation of fine grating is felt if the point of the instrument tears up the urethral wall and forms a false passage. On the occurrence of such an accident the further passage of instruments must be suspended. The urethra should be washed with a warm boracic or permanganate of zinc solution, to which a little hazeline or the tincture of hamamelis (B.P.) may be added if the oozing is pronounced. Copious bleeding rarely occurs. An ice-bag should be applied to the perineum.

A fortnight should elapse before further attempts are made to pass instruments (*see* URINE, RETENTION OF). Additional gentleness should be exercised in the first passage of instruments after this accident, and the urethroscope is invaluable in demonstrating the position of the urethral opening and of the false passage. Where a false passage of old standing is known to be present, it may be avoided by passing a fine bougie gently into it and then introducing a second into the urethra alongside the first bougie.

The appearance of a urethral discharge, and of signs of urethro-cystitis, such as frequent and urgent micturition and murky urine, are the result of imperfect asepsis. They are prevented by the sterilization of instruments, of lubricant, and of the hands, and the washing of the penis and urethra before the passage of instruments. Urinary antiseptics (*vide supra*) are also valuable in preventing the occurrence of the infection and in its treatment. An injection with a hand syringe of a solution of permanganate of zinc ($\frac{1}{2}$ gr. to the ounce), or of sulphocarbolate of zinc ($\frac{1}{2}$ per cent), or a copious daily urethral lavage by means of a douche-can and urethral nozzle with permanganate of zinc (1–5000), will quickly cure the urethritis.

A sense of faintness, or actual syncope, may occur during the passage of instruments. For this reason the patient should invariably be in the recumbent position for the operation. The usual remedies for syncope are adopted, and the instrumentation is suspended. On succeeding instrumentations a solution of eucaine (8 per cent) or novocain (5 per cent) should be injected into the urethra as a precaution against this accident. Cocaine should not be used as a routine measure, on account of the danger of absorption of the drug.

Rigors and catheter fever result from rough handling of instruments, from attempts at rapid dilatation, and from want of asepsis. The measures of precaution against this have been stated above. Some patients are specially sensitive in this respect, and a cutting operation may become necessary.

On the occurrence of a rigor, the patient is put to bed surrounded by hot bottles, and

hot drinks, such as tea or hot gin and water, and the following draught, should be administered :—

℞	Quininæ Sulphatis	gr. v	Spiritus Ætheris Nitrosi		℥xv
	Hexaminæ	gr. x	Infusi Buchu		q.s. ad ℥j

A brisk saline purge should be given.

3. **Cutting Operations in Stricture.**—The patient may desire operation on account of the time taken by dilatation, or the impossibility of carrying out this treatment owing to his residing at a distance from a doctor.

Urethrotomy becomes necessary in strictures where dilatation has failed for the following reasons : (1) The stricture is readily dilated but quickly returns to its previous size (resilient stricture) ; (2) The stricture is dilated up to a certain size (10 or 12 F.), but no further progress can be made (tough, cartilaginous strictures) ; (3) A rigor, and perhaps partial suppression of urine, follows the most gentle attempts at instrumentation (irritable stricture) ; (4) Hæmorrhage : a very few strictures bleed at the slightest touch, and are better cut on this account ; (5) The stricture is very narrow, and a filiform bougie is only passed after much difficulty ; (6) Failure to pass any instrument (impassable stricture).

Strictures complicated in the following manner also require urethrotomy : (7) Complication by some bladder condition which requires investigation or treatment, such as tuberculous disease, stone, chronic cystitis, etc. ; (8) Peri-urethral abscess ; (9) Extravasation of urine ; (10) Fistulæ ; (11) Urethral stone.

Spasmodic Stricture.—The spasm affects the constrictor urethræ, and the obstruction is in the membranous urethra. The obstruction is intermittent ; in an organic stricture it is continuous and increasing if untreated.

In spasmodic stricture a large instrument, if gently handled, will pass on after a slight delay. The use of novocain (5 per cent) is advantageous if the diagnosis has been clearly established.

The cause of the urethral spasm must be diligently sought for, as upon it depends the treatment. Causes of reflex irritation, such as anal fissure, inflamed piles, etc., should be treated, when present. Most frequently the spasm results from some urethral irritation, such as subacute inflammation in the prostatic urethra, or a small stone caught in this portion of the urethra in its outward passage. The latter accident will be treated by passing a large steel bougie and pushing the calculus back into the bladder, when it will be dealt with as a bladder stone. Posterior urethritis is treated by the passage of a large metal instrument and the instillation of a few drops of nitrate of silver solution (5 gr. to the ounce) into the prostatic urethra by means of a Guyon's syringe. Two or three instillations at intervals of a week will usually suffice. Retention of urine as a complication of this condition should be treated by a hot sitz-bath and an opiate, and failing these by the passage of a catheter.

Meatal Stricture.—This is best treated by meatotomy. A few drops of solution of novocain (5 per cent) and adrenalin are instilled into the urethra just behind the meatus, and are expressed again after five minutes. A blunt-probed bistoury is introduced into the narrowed meatus with the cutting edge downwards, and the lower lip of the meatus freely incised in the middle line. Free oozing may result, and is controlled by the application of a pledget containing adrenalin solution, and a little pressure. The cut edge of the urethral mucous membrane should be stitched to the cut edge of the skin by two or three catgut sutures. Sounds must be passed after the first three days, as the lips rapidly unite and the outlet may return to its original size. *J. W. Thomson Walker.*

URIC ACID GRAVEL.—The guiding principles in the treatment of patients who pass crystals of uric acid or urates in the urine are : (1) To diminish the excretion of uric acid by the kidneys ; and (2) To increase its solubility in the urine.

Diet is of the first importance. The usual advice—to lessen the consumption of red meat—is not really sound. It is often much more important to restrict the intake of sugars, starches, and fats. Especially is this the case in stout patients (*see* Obesity). In less well-nourished individuals the diet-plan should be constructed on the same lines as that suitable for gout (q.v.). Alcohol is best avoided altogether if possible, but plenty of pure water should be drunk.

General metabolism should be promoted by regular exercise in the fresh air. In order to maintain the activity of the liver and bowels, small doses of mercury are useful—e.g., $\frac{1}{6}$ to $\frac{1}{10}$ gr. calomel, or $\frac{1}{8}$ gr. blue pill, daily. The natural sulphate waters—e.g., Hunyadi—are very valuable, and a sufficient dose of one of them to produce a free action of the bowels may be taken in a tumblerful of hot water each morning, and continued for weeks if necessary.

The acidity of the urine may be lessened by the use of Vichy or Contrexéville water, or by the administration of citrate of potash. Care should be taken, however, not to render the urine actually alkaline by these means, as that might lead to a deposition of phosphates.

In many cases great benefit is obtained from a course of treatment at Contrexéville, Wildungen, Vichy, Evian, or Carlsbad, especially if the patient be of the plethoric, free-living type. (*See also* CALCULUS.)

Robert Hutchison.

URINE, RETENTION OF.—This results either from a loss of expulsive force of the bladder muscle, or from obstruction at some part of the urethra. The diagnosis must be accurately made before treatment can be undertaken. The surgeon must distinguish between anuria and retention, and between retention due to atony and that due to obstruction.

A patient with anuria refers to previous attacks of renal colic, hæmaturia, or other signs pointing to progressive renal disease, and the cessation of periodic micturition may have immediately followed such an attack. Symptoms of bladder trouble are absent, and have been absent or insignificant during the course of the disease. The patient is in no pain, there is no distention of the bladder, and an instrument passes readily along the urethra into the bladder, but draws no urine.

In retention of urine there is usually a history of gradually increasing difficulty in micturition, the stream has become progressively smaller and more feeble, and there may be some involuntary dribbling of the urine. The bladder is distended, and usually appears as a smooth rounded swelling above the pubes, firm on pressure and dull on percussion. In retention from atony of the bladder muscle, there is no pain and no desire to empty the distended viscus. In obstructive retention, recurrent spasmodic attempts of the bladder to overcome the obstruction usually double the patient up with cramp-like pain. Sometimes a few drops of urine may be squeezed out in one of these attacks. In some patients, however, pain is remarkably absent, and this is especially the case in old men where the obstruction results from enlargement of the prostate. Diagnosis is made by the passage of a large-sized instrument, which enters the bladder easily if the retention be due to atony, but is arrested or retarded if a stricture or other obstruction be present. The absence of obstruction and the discovery of signs of spinal disease clinch the diagnosis.

The following are the chief types of cases that will be met with in practice :—

1. *In Acute Inflammation of the Urethra* (*Gonorrhœa, etc.*), every means should be adopted to relieve the retention without passing a catheter. The patient should be placed in a hot bath or made to sit in a hot sitz-bath, and directed to pass his water in it, and a large hot-water injection should be introduced into the rectum. If this fail, a suppository containing extract of belladonna ($\frac{1}{4}$ gr.) and aqueous extract of opium ($\frac{1}{2}$ gr.) should be given. The following have also been recommended : a minim dose of ferric chloride every five minutes, and half a teaspoonful of spirits of nitrous ether in half a glass of water every fifteen minutes. If relief is not obtained in half to three-quarters of an hour, a catheter must be passed and the urine withdrawn. An anæsthetic will usually be necessary, for the urethra is intensely sensitive. The canal must be thoroughly washed with a solution of permanganate of potash (1–5000) or protargol (1–10,000) from a douche-can, allowing the fluid to flow in and out of the canal. A glass nozzle and a bell shield are used, and prevent splashing. To this 10 or 15 min. of novocain solution (5 per cent) may be added, which may suffice to numb the inflamed urethra for the passage of an instrument. A soft rubber catheter, or failing this a metal catheter, is passed very gently and the urine withdrawn. It is advisable to wash out the bladder with the weak permanganate or protargol solution before the catheter is withdrawn. If a morphia and belladonna suppository has not already been given, one should now be inserted into the rectum, and the patient returned to bed.

If acute prostatitis and a prostatic abscess be present, operation is indicated as soon as possible.

2. *Blocking of the Urethra by Stone, Foreign Bodies, Pedunculated Bladder Growths, Blood-clot, etc.*—The diagnosis is made by the history, and relief by catheterization should be given without delay.

The filling of the bladder with blood-clot from a sudden copious hæmorrhage in a case of bladder growth will cause retention of urine. The condition is serious on account of the grave danger of septic infection of the clot. Very little time should be spent in attempts to break up the clot with metal catheters and washing, or by means of a lithotrite. Suprapubic cystotomy, with washing out of the clot masses and drainage of the bladder with a large rubber drain, is necessary, and should be done by an experienced surgeon.

3. *The Distended Atonic Bladder of Spinal Disease* should be relieved by catheter with the same precautions as are adopted in enlarged prostate. After a few weeks the condition of the bladder improves, so that it regains some of its power, a varying quantity of residual urine persisting, which must be drawn off at regular intervals. Fluid extract of ergot (15 min. thrice daily) is a useful bladder tonic in these cases.

4. *Retention from Reflex Spasm in Diseases of, or after Operation on, the Rectum, Anus, Testicles, etc., and Hysterical Retention.*—In operation cases the catheter is passed without delay, in order to avoid distress. In other cases hot baths and other means (*vide supra*) should be tried before resorting to the catheter. A metal catheter is the best form of instrument in such cases. After relief of the retention, the cause of the spasm should be treated, to prevent recurrence of the symptom.

5. *Retention with Enlarged Prostate.*—The diagnosis is made by the history of the case, the age at which the symptoms commenced, and rectal examination. The preliminary measures detailed above may be tried, but recourse to the catheter will nearly always be necessary. Three points must be insisted upon: (*a*) The most rigid asepsis; (*b*) The delicate handling of instruments; and (*c*) All the urine of an over-distended bladder must not be withdrawn at once, or at least must be drawn off very slowly.

a. The catheters, whether gum-elastic or metal, must be boiled, the hands carefully cleansed, the penis washed with antiseptic, and the urethra washed with permanganate solution.

b. The instrument selected should be either gum-elastic or metal. Coudé and bicoudé catheters are useful, and may pass very easily. Where a difficulty is encountered, it may be due to the distorted shape of the prostatic urethra, and the greatest gentleness should be exercised in pushing the instrument onwards. Sometimes the urine does not flow because the catheter has not been pushed sufficiently deeply along the elongated urethra to reach the bladder.

If the coudé and bicoudé instruments fail, a metal instrument may be tried. Special prostatic metal catheters which possess a very long curve are a part of every set of metal catheters. A method that may be adopted where other means have failed is to bend an English gum-elastic catheter containing its stylet into a curve, which commences by dropping downward from the plane of the shaft of the instrument and then forms a complete curve. This may pass, and if not, it has been recommended to pull the stylet out with the catheter in the urethra, so that the beak of the instrument seeks still further forwards and enters the bladder. Failing these manœuvres, it may be necessary to puncture the bladder suprapubically with an aspirator needle (*see* URETHRAL STRICTURE).

c. Two dangers attend the rapid emptying of an over-distended bladder: hæmorrhage from the vessels of the bladder or kidney, and suppression of urine. The patient must be in bed and in a warm atmosphere. Only 10 or 15 oz. should be drawn off, and an interval of half an hour to an hour should elapse before a similar amount is again withdrawn, and so on until the bladder is empty, the catheter being kept in the urethra meanwhile.

Another method is to withdraw a pint of the urine and introduce in its place half a pint of warm boracic solution, and so on until only boracic solution is left. Or, again, a catheter of very small calibre may be introduced and the urine allowed to dribble slowly away. When the bladder is empty, a few syringefuls of silver nitrate solution (1–15,000) should be injected and allowed to flow away. Stimulants will usually be necessary in

these cases. A mixture containing hexamine 5 gr., liquor strychninæ 5 min., and infusion of buchu 1 oz., every four hours, combines stimulation with antiseptics. Whisky may be given at regular intervals in feeble patients. The catheter should be tied in, and the patient confined to bed for several days. At the end of this time a decision will have to be made as to whether 'catheter life' is to be commenced or an operation performed.

6. *Retention with Stricture.*—A hot sitz-bath and hot rectal injection, followed by a morphia ($\frac{1}{4}$) and belladonna ($\frac{1}{4}$) suppository may be tried, but recourse to instruments will in most cases be necessary. The passage of instruments into narrow strictures has been described elsewhere (*see* URETHRAL STRICTURE). In cases where a No. 7 or 8 French bougie can be passed, it should be withdrawn and a catheter of this size introduced. Where a filiform bougie only will pass, it should be tied in with a fine piece of silk, the ends of which are carried along the sides of the penis and fixed by means of strapping. The urine trickles past the filiform, and after a few hours the stricture will allow of a larger instrument being passed, and eventually a catheter is introduced.

A more rapid method is to use a special instrument, consisting of a metal catheter with conical end which screws on to a filiform bougie. The bougie acts as a guide, and the catheter is forced through the stricture. Harrison's whip bougies are sometimes useful in these cases. They consist of a long tapering gum-elastic bougie, the end of which is filiform, while the shaft rises to a calibre of 18 or 20 F. These may be made with a groove along one side by which the urine trickles away. Catheters of this description may now be obtained, and are a useful means of drawing the urine in a difficult case. Another special instrument is a tunnelled catheter, which can be threaded upon the filiform bougie and pushed through the stricture.

There is less danger in completely emptying a distended bladder in a case of stricture than in enlarged prostate, for the age of the patient is less and the kidneys are usually less extensively diseased. At the same time precautions are necessary to guard against suppression of urine. If instrumentation fails, the bladder should be emptied with an aspirator needle. The most suitable point for the puncture is an inch above the upper margin of the pubic symphysis in the middle line. The percussion note should be dull. The skin is first incised with a sharp scalpel, and then the aspirator needle introduced. The urine will flow from the cannula without a negative pressure being produced.

The dangers connected with suprapubic aspiration of the bladder are puncture of the peritoneum with subsequent peritonitis, leaking of the wound in the bladder, and the formation of prevesical abscess. The peritoneum should not be injured where the bladder is distended and the percussion note dull. The aspirating needle should not be a large one, lest some leakage at the point of puncture take place. A prevesical abscess may result from a septic needle or from a leakage of septic urine.

Usually, after a single aspiration an instrument can be introduced through the stricture and tied in, but rarely the puncture must be repeated several times. In all these cases urinary antiseptics (hexamine 5 gr., boric acid 10 gr., ammonium benzoate 10 gr., syr. aurantii $\frac{1}{2}$ oz., infusion of buchu 1 oz.) should be administered. (For *Nervous Retention, see* ENURESIS.)

J. W. Thomson Walker.

URINE, SUPPRESSION OF.—This may occur as an accidental complication of surgical disorders, and requires prompt and energetic treatment; or it may represent the last phase of a progressive incurable disease such as cancer of the bladder or uterus, and, as such, treatment is unavailing.

The surgical forms of anuria that call for treatment are calculous anuria, post-operative anuria, infective anuria, and hysterical anuria. The latter is included, as it may complicate surgical operations. Calculous anuria may be due to the blocking of one ureter with a stone where the other ureter is free. The suppression of the urinary flow during an attack of renal colic may continue for some hours and pass off with the subsidence of the pain. If it be continued for a longer time it is likely that the other kidney has already been destroyed by calculous disease, and surgical interference becomes urgently necessary. This form of suppression (obstructive) is at first unaccompanied by symptoms of uræmia. The operative measures consist in exploring the kidney and ureter of the side at which pain was most recently felt. The earlier such cases are

submitted to a surgeon the better will be the prognosis. About 50 per cent may be saved by prompt operative interference.

Post-operative anuria may be met with in any form of surgical interference with the urethra, the bladder, or the kidney. The practitioner is most likely to meet with it after the use of instruments for dilatation of stricture of the urethra, or after the passage of a catheter in a case of enlarged prostate with retention of urine. Some hours after the passage of instruments, often after the first passage of urine, the patient has a rigor, the temperature rises to 102° or 103°, the urine rapidly diminishes, the secretion ceases, and the patient becomes restless, delirious, and finally dies comatose.

The prophylaxis of this very fatal complication has been described under URETHRAL STRICTURE. It is summed up in the following: avoidance of traumatism in passing instruments, asepsis, protection against chills, and administration of urinary antiseptics during the treatment of stricture.

When suppression sets in there are three objects to be aimed at: (1) To re-establish the flow of urine; (2) To remove toxic bodies from the circulation; (3) To maintain the strength of the patient.

Diuretic drugs should be given, e.g., citrate of potash 7 to 10 gr., spiritus ætheris nitrosi 20 to 40 min., infusion of buchu or infusion of scoparius 1 to 2 oz., every four hours. The rectum should be washed out and a large saline enema introduced. Counter-irritation to the kidneys should be applied in the form of local poultices, mustard leaves, or turpentine stupes, or as dry cupping.

Should these means fail, infusion of glucose solution (2½ per cent) should be given into the median basilic vein. Two pints of the solution are introduced under strictest aseptic precautions. In the writer's experience this is the most powerful means at the command of the surgeon for producing diuresis.

The bowels should be freely opened. If the patient is not vomiting, an ounce or more of magnesium sulphate in a small quantity of warm water may be given by the mouth. A large, hot saline injection may be passed into the colon by means of a long rectal tube, or an enema of soap and water, or one containing turpentine 1 oz., or sulphate of magnesia 1 oz. and glycerin ½ oz.

The skin should be made to act as freely as possible, but in producing diaphoresis it must be remembered that there is some tendency to collapse in these cases. A hot pack, hot dry air, or vapour bath may be given. Pilocarpine should be used with caution. A hypodermic injection of $\frac{1}{60}$ gr. may bring about a copious and beneficial diaphoresis.

Stimulants should be freely given. Alcohol, ammonium carbonate, digitalis, and strophanthus may be administered by the mouth, and strychnine hypodermically in doses of $\frac{1}{30}$ gr. every four hours. *J. W. Thomson Walker.*

URTICARIA.—The successful management of this troublesome and intractable malady consists in discovering the cause—if one can.

Amongst common causes the following should be borne in mind: (1) External parasites; (2) Articles of diet, e.g., shell-fish, mushrooms, pickles, pork, eggs, cheese, oatmeal, strawberries or other fruits, and sour wines (but almost any article of diet may cause it in persons who have an idiosyncrasy: an intelligent patient, by keeping a watch on his diet and noting the incidence of attacks, may sometimes discover for himself the offending article); (3) Certain kinds of clothing, e.g., flannel, or the wearing of dyed materials next the skin; (4) Uterine and ovarian irritation in women; (5) A gouty constitution.

Inquiry should also be made as to the use of any possible external irritants, e.g., skin or hair lotions.

In *acute cases* it is well to begin treatment with a purge and, if there be any signs of gastric irritation, by the administration of an emetic. These may be followed by sodium phosphate 1 drachm every four hours. Meanwhile the diet should consist of milk only. Locally, one of the applications mentioned below may be used to relieve itching.

In *chronic cases*—failing the discovery of any cause—the treatment is: (1) Local; (2) General.

1. Itching may be relieved by warm baths of half an hour's duration, containing either 8 oz. of potassium sulphuratum or 2 lb. of sodium bicarbonate to 30 gallons of water;

or menthol or naphthol soap may be used with an ordinary warm bath. After remaining for ten to fifteen minutes in such a bath, the skin is lightly dried and one of the following applied :—

a. Lotions :—

℞	Acidi Carbolici vel Mentholis	ʒj
	Glycerini	ʒij
	Spiritus Rectificati	ʒiij
	Aquæ Camphoræ	ʒv

℞	Lotio Carbolici	1–40

℞	Acidi Hydrocyanici Diluti	ʒj
	Liquoris Carbonis Detergentis	ʒij
	Aquæ Destillatæ q.s. ad	ʒx

b. Ointments :—

℞	Beta-naphtholis	ʒj
	Lanolini	ʒij
	Unguenti Simplicis	ʒj

℞	Vaselini Salicylici	2 per cent

℞	Unguenti Diachyli	partes æquales
	Ung. Picis Liquidæ	

c. A dusting powder of oxide of zinc, talc, camphor, and starch.

Linen or silk should be worn next the skin both day and night, and the bedclothes should not be too heavy.

In obstinate cases, a strictly lacto-vegetarian diet is always worth a trial.

2. Many *internal remedies* have been recommended, some of which succeed in one case, some in another. Amongst these are the following : salol (10 gr. thrice daily) ; ichthyol (5 min. in capsule thrice daily) ; salicylate of quinine (5 gr. thrice daily) ; calcium lactate (10 to 20 gr. thrice daily for three days) ; citric acid in effervescing mixture ; phenazone or phenacetin ; colchicum in gouty cases ; thyroid extract, gradually increased ; atropine (gr. $\frac{1}{120}$ to $\frac{1}{100}$ in pill at bedtime) ; palatinoids of 1 gr. permanganate of potash.

The use of the high-frequency current (fifteen minutes on the couch, current of 300 ma. and local effluve) is also said to have cured some obstinate cases.

In **Giant Urticaria** the above internal remedies may be tried, but those most likely to be useful are calcium lactate, colchicum, or the salicylates. In acute cases a purge of pulv. rhei co., or an emetic, may cause the disappearance of the swelling. In order to prevent recurrence, the general health should be kept at as high a level as possible and tonics administered if necessary. The use of tea and coffee should be stopped for a time. Dyspepsia and intestinal putrefaction should be specially avoided. For the latter, acetylsalicylic acid, menthol, and camphor are to be recommended. A mild course of thyroid treatment is sometimes helpful. If a mucous surface is involved, adrenalin may be applied locally.

Lichen Urticatus is the form of urticaria most commonly met with in children, and must be treated on the above lines. Worms must always be remembered as a possible cause in such cases. The diet must be simple, and should contain no fish or raw fruit. Locally, the writer has found tar applications (e.g., one teaspoonful of liq. carbonis detergens to half a pint of water) relieve the itching best, with or without the aid of the baths mentioned above. These should be given in the morning, and not at bedtime. Internally, small doses of rhubarb, soda, and grey powder are sometimes helpful, or 5-min. doses of ichthyol with an equal quantity of glycerin. Quinine (1½ gr., in a sugar-coated tablet, for each year of the child's age) may be given at bedtime.

(*See also* Pruritus.)

Robert Hutchison.

UTERINE HÆMORRHAGE.—(*See* Hæmorrhage, Uterine.)

UTERUS, CARCINOMA OF.—(*See* Menorrhagia.)

UTERUS, DISPLACEMENTS OF.—These do not occupy their former high place in gynæcology, but require treatment if they cause pain or discomfort.

1. **Anteflexion and Anteversion.**—The virgin uterus is generally markedly anteflexed and anteverted, and unless the uterus is bent forward by the contraction of inflammatory adhesions—a very rare condition—anteflexion and anteversion require no treatment. The fact that the cervix can be felt 'bulging into the rectum' does not prove the presence of any abnormal condition. The presence of marked anteflexion in a case

of spasmodic dysmenorrhœa does not prove that the anteflexion is responsible for the dysmenorrhœa.

2. **Retroflexion and Retroversion.**—These conditions, which may be considered together for our present purpose, are very common, and are often of no importance, causing no symptoms and needing no treatment.

If the retroversion is due to a slight degree of prolapse, this should be treated, usually by a ring pessary. If there is no prolapse, and the patient complains of backache, increased in severity just before the periods, pain on defæcation, and dyspareunia, and it is found that pressure on the body of the uterus or ovaries through the posterior fornix causes pain, we may conclude that the retroversion is responsible for some or all of the symptoms. The treatment consists in pushing up the fundus, preferably by one or two fingers, and then anteflexing and anteverting the uterus by bimanual pressure. If the reposition is successful, a ring pessary or Hodge's pessary should be inserted to keep the uterus in the proper position. If attempts at digital or manual reposition fail, reposition may be effected by pulling on the anterior lip of the cervix with volsella forceps, while the fingers push up through the posterior fornix. Failure to replace the uterus, although it is freely movable, is often due to the upward pressure being applied in the middle line. Success may follow pressure which is made a little towards the left side, so as to avoid the sacral promontory.

Insertion of a Hodge's pessary without previous correction of the faulty position is useless. After insertion of the pessary an examination should be made to ascertain whether the uterus is remaining in the proper position or not, as the presence of the pessary will only aggravate the symptoms if the retroflexion returns. Hodge's pessaries are often inserted upside down or hind-before, with, as might be expected, disappointing results.

If the fundus of the uterus is found to be fixed, probably by adhesions, no forcible attempt at reposition should be made. The choice of treatment in such a case lies between attempts to secure absorption of the inflammatory adhesions by rest, hot douches, medicated tampons, etc., and abdominal section.

It is most unwise to tell the patient that her uterus is bent, or in the wrong position. To do so is to sow the seeds of neurasthenia and chronic invalidism.

3. **Prolapse of the Uterus and Vaginal Walls.**—The treatment of these conditions depends on the degree of prolapse. It can be considered most easily under the following five headings: (*a*) Cystocele; (*b*) Rectocele; (*c*) First degree of prolapse of the uterus, i.e., when the uterus is lower down than it should be, but is still entirely inside the vagina; (*d*) Second degree of prolapse, i.e., when the uterus is partly inside the vagina and partly outside; (*e*) Third degree of prolapse, i.e., when the uterus is entirely outside.

a. Cystocele.—If there is simple relaxation of the anterior vaginal wall, this may possibly be remedied by douches containing alum. If a pessary is needed, a ring is best when the vagina is roomy, and a small Graily Hewitt's pessary when the vagina is atrophied in elderly women.

b. Rectocele.—This condition is often found by itself, particularly in middle-aged and elderly women. No form of pessary, except perhaps Zwancke's butterfly pessary, or, in some cases, a cup-and-stem pessary, will do any good. The best treatment is posterior colporrhaphy, with advancement of the perineum.

c. d. If the vaginal orifice is not too large, a ring pessary should be used, except in cases where the rectum is tender. In such cases a Hodge's pessary often gives better results, its surface in contact with the rectum being 'bevelled' as it were. If the vaginal orifice is too large for a ring to be retained, the choice lies between a cup-and-stem pessary attached to a waist-belt, or some operative procedure.

e. In cases of complete prolapse, the first thing to do is to push the uterus, bladder, and inverted vaginal walls upwards. This is done easily as a rule, but occasionally it is impossible until the patient has lain in bed for twenty-four hours or so, preferably with the pelvis raised. In rare cases an anæsthetic is necessary. To keep the uterus up, recourse must be had to a cup-and-stem pessary, or to operation.

The friction ulcers seen commonly on the exposed surface of the cervix and vaginal walls usually heal in a short time when the uterus is kept in its place. A douche of lead lotion is to be advised.

A patient who is wearing a pessary should douche herself with a solution of a drachm of common salt to a pint of water, or use an astringent douche, e.g., a solution of alum or tannic acid, and should be told that she must not go longer than three months without having the pessary changed. For most patients a daily douche is necessary. An intelligent patient may be taught to remove a ring pessary herself, clean it, and replace it. It is practically impossible for a patient to replace a Hodge's pessary herself. If she attempts to do so she will probably get the upper end in front of the cervix instead of behind it.

4. **Chronic Inversion of the Uterus.**—This should be treated by continuous pressure with Aveling's repositor. The vagina should be packed with gauze so that the repositor cannot slip, and the patient should be examined at short intervals while the instrument is *in situ*. If these precautions are not taken, the edge of the repositor, blunt though it is, may cause ulceration, or the instrument, having done its work, may become gripped by the cervix and retained in the cavity of the uterus. *H. Russell Andrews.*

VACCINE THERAPY.—(*See* SPECIFIC THERAPY.)

VAGINISMUS.—In cases where sexual intercourse is impossible on account of spasmodic contraction of the sphincter vaginæ, often accompanied by adduction of the thighs and sometimes by opisthotonos, a careful search should be made for any tender spot. If any such local cause can be found it must be treated (*vide* DYSPAREUNIA *and* STERILITY). In some cases it is found that the hymen has never been satisfactorily stretched or torn, and stretching or removal under an anæsthetic may cure the vaginismus. In other cases nothing abnormal is found. If the patient has been married only a short time, dilatation under an anæsthetic is usually all that is necessary. One finger is inserted, then the tips of two fingers, until by a gradual process of stretching two or three fingers can be inserted. If this is done gradually, there is as a rule no deep tearing and no bleeding beyond a little oozing. Should the vaginal wall be torn, however, there may be troublesome bleeding, to check which the vagina must be packed with gauze, so care must be taken that the orifice only is stretched. It is well to have catgut sutures ready in case a tear of the hymen should bleed freely. Some operators always pack the vagina with gauze, the removal of which next day without an anæsthetic convinces the patient that there is no abnormal narrowness. If the hymen has been torn and the caruncule hymenales are very sensitive, it may be wise to dissect them off. In cases where the sphincter vaginæ is very strong, its spasmodic contraction narrowing the orifice unduly, stretching is not enough, and part of the sphincter must be cut through. This little operation, colpoplasty, is useful in cases where the husband is less virile than is normal. A fairly deep median incision is made through the lower part of the posterior vaginal wall into the tissues of the perineal body. The wound is sewn up so as to make a transverse scar, thus causing a permanent enlargement of the vaginal orifice.

After stretching or enlargement of the vaginal orifice by incision, glass vaginal dilators of graduated sizes should be inserted for a few days until the patient realizes that the passage of a foreign body into the vagina is possible and practically painless.

In many of these cases there is a neurotic element, which must be treated by improvement of the general health, etc. *H. Russell Andrews.*

VARICELLA.—(*See* CHICKEN-POX.)

VARICOCELE.—The treatment required for this condition may be either palliative or radical. Palliative treatment is sufficient for the great majority of cases, but radical measures are sometimes indicated when the local trouble is great, and are inevitable when 'Service requirements' call for their employment. When free to choose, the surgeon will operate but seldom. The slighter cases do not require such treatment, and the graver ones often suggest the co-existence of an underlying psychological abnormality which no operation can reach or benefit. It is a fact that the melancholia which is sometimes associated with these cases may be increased by an operation which is quite successful in its local results. On the other hand, when the local trouble is serious, but at the same time unaccompanied by the graver symptoms of neurosis, excellent results

may be expected. Even then, however, the operation is not one to be undertaken lightly.

It has been stated by eminent authorities that atrophy of the testicle never follows varicocele. It seldom does, though abnormal softness and flabbiness of the organ are not infrequently noticeable; but that atrophy may occur I am certain, for I have watched its development. It must be admitted, however, that atrophy of the testicle following varicocele occurs most commonly as a direct result of hopeless anatomical injury inflicted during operation, which has sometimes included not only destruction of the small veins of the areolar tissue surrounding the vas—on which the parts below the seat of operation depend for venous return after the main trunks have been ligatured—but even ligature of the spermatic artery itself. These risks are to be avoided by careful operation. The areolar tissue surrounding the veins which are to be tied and removed must not be wounded or injured, except in so far as is necessary to expose the veins for dissection. The dissection must then be made close and clean off the veins, conserving most carefully the tissue in which they lie embedded. On no account are the veins to be separated by any crude incision through the connective tissue uniting them with the other constituents of the cord. It is also to be remembered that even in careful and experienced hands, the maintenance of an adequate venous return is not absolutely assured. The risks are slight if due care be exercised, but the minute veins of the connective tissue have been known to prove unequal to the task imposed on them.

For the majority of cases treatment is simple. We are to enjoin obedience to well-known laws of health. Regular exercise, attention to the state of the bowels, avoidance of sexual excess, and sometimes the desirability of marriage, should be specially recommended, and for local measures the use of a suspensory bandage and frequent cold bathing. The indications for operation are: (1) A large varicocele with pain on standing or after exercise, and increased by hot weather or sexual excitement; (2) 'Service demands'. Many young men otherwise eligible are refused admission to the public services for a small varicocele. It is necessary for their admission that this should be removed, though there are no surgical indications for the operation.

The Operation.—The veins are to be carefully dissected from other structures of the cord through an inch-long transverse incision over the external abdominal ring, and excised between ligatures, one above and the other below. The cord should be shortened at the same time by transfixing the stumps of the cut veins and tying their ends together. No drainage is required. The patient should be kept in bed or in a recumbent position until the wound has soundly healed and a strong cicatrix has formed. In from twelve to fourteen days he may get about with a suspensory bandage, but it will be from four to five weeks before the full beneficial effects of the operation will be experienced. Before undertaking the operation, any atrophy of the testicle present at the time should be noted.

Rutherford Morison.

VARICOSE VEINS.—Treatment as affecting the leg only will be considered. Varicocele and hæmorrhoids are separately dealt with elsewhere. Other varieties of varicose disorder are by comparison of minor surgical importance, and their treatment in the main is deducible from the general features of that applying to the leg. The treatment may be either palliative or radical.

In many cases no appreciable discomfort is experienced from even large varicose veins, and for these, beyond cold bathing and rubbing, nothing is needed.

In a large number of instances fatigue is felt after walking or prolonged standing, and there is a sense of fullness and heaviness in the limb. The indications will generally be to remove any hindrances to the return of venous blood from below, such as tight garters and corsets, fæcal accumulations in the sigmoid flexure, abdominal tumours, etc., and to forbid prolonged standing.

Local treatment by an efficient support is of the greatest importance. A well-fitting elastic stocking is most easily applied and most serviceable. These require, however, frequent renewal, as they soon become useless, and the yearly cost of their upkeep is considerable. An elastic bandage, or one possessed of elasticity, such as of flannel or crêpe, if carefully applied from the foot upwards, every morning before rising from bed, serves the same purpose as the elastic stocking, and without expense. Rubbing the limb,

especially from below upwards, and cold bathing are valuable aids towards keeping the skin healthy and the veins free from engorgement. For the majority of patients I know of no exercise so suitable as cycling.

Cases for Operation.—In most instances the troublesome varicose changes occur in the internal saphenous vein and its tributaries. In these cases—and in these only—operation gives very satisfactory results.

The Indications for Operation are: (1) Nutritional disturbances of the skin of the leg, e.g., eczema and ulcer; (2) Adhesion of the dilated veins to the thin, stretched, overlying skin, which makes rupture possible; (3) Swelling, pain, and weakness in the leg which have resisted other treatment; (4) In some instances, inflammation and thromboses of the diseased veins. Thus, operation may be specially called for when thrombosis is gradually extending upwards towards the saphenous opening, and threatening to invade the deep trunks, or when portions of the thrombus have been detached, and have caused symptoms of embolism. In these inflammatory conditions the upper end of the vein should be ligatured at the commencement of the operation in order to obviate *immediate* risks of embolism.

No operation should be done on cases following obliteration of the deep veins by previous disease, or on cases dependent on an arteriovenous communication.

The Operation.—Many operations are described, but only two require serious consideration. These are: (1) Excision of the upper part of the internal saphenous vein (Trendelenburg's operation); (2) Excision of the vein from the ankle to the saphenous opening. Our choice between these two operations can be settled by a test. The veins are to be emptied by elevation of the limb, the patient lying down. Then, if a finger be pressed over the upper part of the saphenous vein and the patient stands up, no rapid refilling of the veins may occur. If the finger pressure is relaxed, the diseased vein may quickly distend, showing that its valves are incompetent, and suggesting that excision of the upper part of it (Trendelenburg's operation) may suffice, but it seldom does. If, in spite of finger pressure above, the diseased veins fill on the assumption of an erect posture, excision of the whole vein is indicated. The very long incision required for this has always, in my experience, healed without trouble, though it must be remembered that any operative interference with veins, apart from the risks of sepsis, which are avoidable, are attended by the danger of pulmonary embolism, from which several deaths have been recorded. The upper portion of the vein can be easily removed through a short transverse incision over it at the upper end, and a second or more below. After exposure of the vein above, it is divided, ligatured at its proximal end, and clamped below. It is again exposed by a short transverse incision about ten inches lower down, clamped below, and divided above the clamp. A long eyed or acorn-pointed probe is then passed upwards into the open end of the vein till it reaches the upper exposed portion. A ligature round the acorn head of the probe and the vein, or a suture through the vein and the eye of the probe, fixes the two firmly together. By traction on the probe the vein is drawn out and removed, more readily by the eyed probe, which withdraws the vein turned inside out instead of crumpled up as with the other probe. This process may be repeated lower down till the whole vein has been extirpated; but it is not as a rule satisfactory for the leg portion, where adhesions to the skin and surrounding parts are usually present, and excision there is a better method.

The incision should as far as possible avoid the most unhealthy portions of skin. Though it must cross the bends of a sinuous dilated vein occasionally, it should on the whole take a marginal course, so as to run clear of the thin, stretched skin by which the vein is covered. When skin and vein are adherent, the skin must be excised with the vein. In addition to excision of the vein trunk, any specially dilated portions and saccules should be excised through small separate incisions.

Hæmorrhage from varicose leg veins is of infrequent occurrence, but may be fatal. The bleeding is usually due to spontaneous rupture of a sacculus of the internal saphenous vein. The horizontal posture, with removal of constriction above, elevation of the limb, and a pad with a moderate compression bandage, at once stops the bleeding in these cases. As soon as the skin wound has healed, the diseased vein should be excised.

Rutherford Morison.

VARIOLA.—(*See* Small-pox.)

VERTIGO.—This condition is the result of many pathological states; the following include the more common of these :—

1. **Ocular Vertigo.**—Treatment consists in the correction of the ocular defect (paralyzed muscle, myopia, etc.). (*See* EYE, INJURIES OF.)

2. **Aural Vertigo** (Auditory vertigo, Ménière's disease).—This is by far the commonest form of true vertigo, and the ears should therefore be carefully examined in every case. It is first necessary to negative the existence of any removable exciting cause (cerumen, tympanic catarrh, active middle-ear disease). Partial occlusion of one Eustachian tube is a common cause, and in such a case the middle ear should be inflated through a Eustachian catheter. Gout and syphilis are held to act in some cases as a predisposing cause; any evidence of active manifestation of either will call for its appropriate treatment. (*See* EAR (Internal), GOUT, and SYPHILIS.)

In all cases, counter-irritation behind the ear is useful. Iodine should be applied every night until the skin is blistered: equal parts of strong and weak tincture of iodine.

Internally, the bromides and iodides are of great value, especially if combined with belladonna.

℞				
	Potassii Bromidi	gr. xv	Tincturæ Belladonnæ	℥v
	Potassii Iodidi	gr. x	Aquæ Destillatæ	q.s. ad ℨss
	Liquoris Arsenicalis	℥iij		

Thrice daily in a little milk after food.

In obstinate cases, quinine sulphate is worth a trial, 3 to 10 gr. thrice daily in milk.

Another remedy which has been strongly recommended is the administration of salicylate of sodium with gelsemium :—

℞				
	Sodii Salicylatis	gr. xv	Tincturæ Gelsemii	℥xx
	Spiritus Ammoniæ Aromatici	℥xv	Aquæ Destillatæ	q.s. ad ℨss

Three times daily.

Tincture of jaborandi in doses of thirty minims, gradually increased to one teaspoonful, thrice daily, has been found useful in intractable cases.

In some of these cases the condition is associated with, perhaps dependent on, senile cardiovascular changes, and due attention to arrest of high blood-tension will give relief. In a considerable number, spontaneous cure may be looked for, usually with more or less complete deafness. Recently electricity has been employed, with encouraging results. The galvanic current should be used, with the negative electrode in the auditory passage, and the positive electrode upon the dorsal or lumbar regions. The ear electrode, with the help of a pledget of absorbent cotton, is extended as far as possible to the tympanum. The mean intensity of the current employed is from 15 to 20 milliampères; each application lasts from twelve to fifteen minutes, and should be repeated three times per week.

Surgical intervention must be considered in cases which have failed to respond to prolonged general and local treatment, and where the vertigo renders the patient's life intolerable. (*See also* EAR, AFFECTIONS OF.)

3. **Gastric Vertigo.**—Recurring vertigo sometimes occurs in the subjects of various stomach ailments. Some authorities insist that in such the dizziness is always due to a coincident aural cause. In treatment, it is certainly important to make sure that no other origin for the vertigo is present. The stomach affection may be comparatively trivial, or grave. Relief can be given only by treatment appropriate to the gastric condition. (*See* DYSPEPSIA, ATONIC, and STOMACH DILATATION.)

4. **Neurasthenic Vertigo.**—The subjects of neurasthenia not infrequently complain of recurring dizziness, and this symptom may be a very prominent feature of their sufferings. Their disordered imaginations conceive it to indicate grave cerebral peril. To reassure the patient is an important part of the treatment, which otherwise consists in the general management of the neurasthenic state. (*See* NEURASTHENIA.)

5. **Epileptic Vertigo.**—Epileptics are prone to vertigo; the attacks may alternate with, or replace, the more typical fits. The treatment is that of epilepsy.

6. **Migrainous Vertigo.**—True migraine may manifest itself in dizzy fits. (*See* MIGRAINE.)

7. **Vertigo from Organic Diseases of the Central Nervous System.**—Attacks of vertigo are sometimes an early or late sign in grave disease of brain or cord. They may occur in

acute brain conditions such as cerebral hæmorrhage, or in chronic states, as cerebral or cerebellar tumour. Tabes dorsalis and insular sclerosis are examples of spinal cord disease in which vertigo is common.

8. **Cardiovascular Vertigo.**—The subjects of arteriosclerosis are exceedingly prone to vertigo, which, with or without epileptiform seizures, is frequently a prominent feature. In association with bradycardia, it constitutes the Stokes-Adams symptom-complex. The vertigo calls for no special treatment beyond that of the associated circulatory changes. (*See* ATHEROSCLEROSIS.)

In addition to the above, a considerable number of diseased states may manifest themselves by vertiginous symptoms. In anæmia from any cause, and chronic uræmia, vertigo may be the prominent complaint. Vertigo has also resulted from the wearing of too tight a collar. Constipation, and the presence of certain intestinal parasites, also may give rise to troublesome giddiness. Sea-sickness and cliff-sickness are examples of vertigo occurring in healthy people. For the treatment of all these, the reader must be referred to the appropriate sections of this work. (*See also* SETON, TREATMENT BY.)

Lewis Smith.

VINCENT'S ANGINA.

This affection has occurred very frequently during the War, when a large number of men have been congregated in crowded camps. It is caused by the association of the specific organisms, the *Bacillus fusiformis* and *Spirochæta vincenti*. It manifests itself chiefly in the mouth and throat, but it is also the cause of trouble in other parts of the body.

In the throat it has to be differentiated from diphtheria, syphilis, scarlet fever, and measles. It frequently occurs with them and is overlooked, because the organisms can only be found by examining the smear directly, as they do not grow in the ordinary culture medium.

In the commonest form, a false membrane is found which looks very like diphtheria; it often bleeds when the membrane is removed. It also occurs as ulceration of the tonsils or gums, more particularly if they are septic or if there are septic teeth or stumps present. Many cases of pyorrhœa with deep-seated cavities are really due to Vincent's disease.

TREATMENT.—The teeth must be attended to, and the membrane cleared off by rubbing with peroxide of hydrogen; the tonsils and parts affected should then have the following mixture applied several times a day:—

℞ Tincturæ Ipecacuanhæ ℥iv | Glycerini ℥j
Liquoris Arsenicalis ℥iij |
Ft. mist.

Apply to affected parts every two hours. Care should be taken that the lotion is not swallowed. Salvarsan applied locally is often very effective. *George C. Cathcart.*

VISCEROPTOSIS.—(*See* GASTROPTOSIS.)

VOLKMANN'S ISCHÆMIC PARALYSIS.—This condition is due to the deprivation of muscles of their supply of arterial blood, temporarily or permanently, and probably associated interference with the return of venous blood. It is commoner than recorded cases would lead one to suppose, being usually attributed to tight splints or bandages, and therefore suggesting an implied criticism of the treatment followed. It may, however, follow injury of the vessels at the time of the original accident, ligature of a vessel, or blocking of a vessel by embolus.

The condition is much more common in the arm than in the leg. In about half of the arm cases there is an associated lesion of one or more nerves, and the muscle contraction is apt to be overlooked if the nerve lesion be recognized first, or vice versa. The nerve lesion may be due to the original accident, or it may be due to the implication of the nerve-trunks as the effusion in the forearm organizes into connective tissue.

The diagnosis is clinched by the fact that the fingers, flexed as they were when the wrist is straight, can be extended more when the wrist is flexed. The median, ulnar, and often posterior interosseous, nerves must be investigated, and scars of pressure sores in the flexure of the elbow-joint are fairly common. If the condition be recognized soon after its onset, and adequately treated, the prognosis is good. In cases of long standing, the treatment is tedious and complete functional recovery very rare.

In the way of treatment there are two operations which must be mentioned, but not

recommended. The first is the lengthening, by plastic operation, of each tendon at the wrist on the flexor aspect. It is a very tedious operation, and on the whole the results are not worth the risk of a hand possibly less useful in function although improved from a cosmetic point of view. The second operation is excision of segments of both radius and ulna to make the bones fit the shortened muscles. But three things must be noted: (*a*) The limb's blood-supply is suspect, and therefore there is a danger of non-union of the bones; (*b*) The extensor muscles are weakened; and (*c*) The operation must add to the amount of scar tissue already in the forearm.

For cases in which the condition is established, the best treatment is on the physiological and mechanical lines advocated by Sir Robert Jones in the last edition of this book, and I cannot do better than repeat his description:—

"The procedure is as follows: First, an assistant passively flexes the wrist; this causes the fingers to extend, and in this position small sheet-metal finger-splints are fixed to each digit with strapping. Over these, at the same sitting or a day or two later, a flat palmar splint is strapped to keep the phalanges and metacarpals in line. Next, at intervals of two or three days, the wrist is gradually extended a few degrees at a time till the wrist and hand are in extreme dorsiflexion. The first sign of recovery is a restoration of pulp in the tips of the fingers, which are left exposed. Next, the patient recovers a little power of voluntary dorsiflexion. From this stage, perseverance in the treatment by position, aided by massage of the muscles of the forearm, will lead to the desired result. In milder cases of recent origin, good results are almost certain; in severe cases of long standing, improvement is very slow and tedious, but it is always safe to predict a considerable degree of recovery."

Finally, prevention is better than cure. Never should an elbow or knee be bandaged in an extended position and then flexed, or the vessels may be occluded. Any splint applied to the forearm anteriorly must be applied with the elbow flexed, or subsequent flexion may occlude the vessels by pressure from the upper end of the splint. All splints applied, to the forearm especially, must be efficiently padded, and bandages loosened at once if signs of circulatory disturbance appear in the fingers. In any case of injury about the elbow-joint with disappearance of the radial and ulnar pulses, the prognosis should be guarded till the condition of the muscles of the forearm can be investigated two or three days later. *Robert Milne*

VOMITING IN CHILDHOOD.—In children, as in older persons, vomiting may be due to gastric derangement, or may be symptomatic of a general disturbance, such as an eruptive fever, or of the onset of a local disease outside the alimentary canal, such as nephritis, cerebral disease, etc.

Symptomatic vomiting need not be interfered with unless it becomes distressing. Should it be so a sedative may be given, such as $\frac{1}{20}$ gr. of cocaine in a teaspoonful of water (to an infant of six months old), or a hypodermic injection of $\frac{1}{40}$ gr. of morphia. Obstinate vomiting may result from a hernia or an invaginated bowel, and must be treated, of course, by appropriate measures for relieving those conditions. Vomiting arising toward the end of an attack of diphtheria is suggestive of heart failure, and the proper steps must be taken at once to meet this formidable complication.

When vomiting occurs in gastric derangement, it is the result of catarrh of the stomach set up either by a chill or by inappropriate or excessive feeding. It is common enough in infants, and is one of the chief causes of the high mortality amongst the children of the poor. In a healthy child, mere regurgitation, immediately after a meal, of a portion of the food taken is not to be looked upon as a sign of gastric disturbance. The milk is returned without retching or any sign of effort, and its appearance merely shows that more food has been swallowed than the stomach can comfortably retain. Even sucking infants who are strictly confined to the breast are subject to catarrhs, during which the milk is vomited sour and curdled, with every sign of gastric distress. But it is a mistake on this account to wean the child. All that is necessary is to forbid suckling for twenty-four or forty-eight hours, feeding the child in the meantime with barley-water, flavoured in alternate bottles, with a teaspoonful of extract of malt. The mother's milk can be drawn off with a breast pump, but it must not be given to the infant. For medicine we may order:—

℞ Zinci Sulphatis gr. $\frac{1}{12}$ | Infusi Chiratæ
Glycerini ℥v | q.s. ad ℥ss

To be given three times a day before food.

Or, 3 gr. of citrate of potash in the same bitter infusion.

In hand-fed babies, vomiting from gastric catarrh at once suggests a revision of the dietary, for, as in the case just referred to, a diet which is well suited to a healthy stomach often ceases to agree in the altered conditions. If the vomited matters are sour, special attention should be paid to the quantity of milk given in each meal, and it may be necessary to reduce this to a half, a quarter, or a sixth part of that originally allowed, or even to forbid it altogether. Its place can be taken by veal broth made weak and thickened with barley and strained; peptonized or citrated or dried or condensed milk; fresh whey with cream and barley-water; or whey and barley-water with Mellin's food. The size of the meal is also of importance. Vomiting of the food must be taken to show that too much has been swallowed, and therefore less must be allowed for the next meal. In bad cases, one teaspoonful at a time is often all that can be retained. If so, this must be given every quarter of an hour. If the child is very weak, cold white-wine whey in teaspoonful doses may be given frequently.

It is, of course, essential that everything ordered should be perfectly fresh and in good condition. Whey, after four hours, cannot be given to the infant with safety, and barley-water must be considered stale after six hours. Attention, too, must be paid to the absolute cleanliness of the spoons and feeding-bottles (*see also* INFANT FEEDING). For medicine, the remedies used may be those above recommended. But we may order also small doses of arsenic or ipecacuanha with an alkali and bitter infusion, or a combination of the tinctures of rhubarb and nux vomica. Thus, for a child six months old:—

℞ Liquoris Arsenicalis ℥ss | Glycerini ℥x
(aut Vini Ipecacuanhæ) | Infusi Chiratæ q.s. ad ℥ss
Potassii Citratis gr. iij

To be given three times a day.

Or,

℞ Tincturæ Nucis Vomicæ ℥ $\frac{1}{6}$ | Glycerini ℥x
Tincturæ Rhei Compositæ ℥ij | Aquæ Menthæ Piperitæ q.s. ad ℥ss

To be given three times a day.

In cases where the vomiting is obstinate, ingluvin in doses of $\frac{1}{6}$ gr. every three hours is often a successful remedy. Another equally valuable one is calomel: $\frac{1}{8}$ gr. to be laid upon the tongue every hour.

If the stomach contractions are violent, a poultice containing $\frac{1}{6}$ part of mustard should be applied for several hours to the epigastrium. If the vomiting has persisted for several days before the child comes under observation, and the gastric irritability is not quickly allayed, it is well to wash out the stomach.

In hand-fed babies, vomiting, if neglected, or unskilfully treated, is apt to become chronic. In such cases it will be noted that the feet and legs are habitually cold, and the first step in the treatment will consist in covering the lower limbs and feet with a thick layer of cotton-wool. This simple measure in itself is often successful, and the sickness ceases when the feet are warm. At the same time, measures must be taken to prevent fresh chill, and it is well to revise the dietary upon the lines already laid down, and, for medicine, to prescribe one or other of the remedies recommended above.

An occasional form of vomiting which, if it continues, may reduce an infant to a state of extreme emaciation, and even prove fatal, is that which results from monotony of diet, the child being fed morning, noon, and night on the same thing. Each meal is vomited with little effort, quite unchanged, and the infant seems to keep almost nothing on his stomach. If a change be made to another food the vomiting ceases for a day or two, but returns as soon as the stomach has got used to the alteration. The simple remedy for this state of things is variety in the meals, and a mere difference of flavour is all that is needed. A teaspoonful of Mellin's food or extract of malt added to each alternate bottle during the day, with a third food for the night, usually makes a sufficient variety; but in exceptional cases the diet must be so arranged that no two meals in the twenty-four hours shall have quite the same taste.

In the case of older children vomiting must be treated on exactly the same lines. A revision of the dietary is essential. Sweets and fruit must be forbidden, and milk and starch allowed only in very small quantities; indeed, in many, if not in most children, vomiting is apt to persist as long as milk continues to be taken. If the attack is acute it is best to allow nothing but water, hot or cold according to the taste of the patient, and to apply a hot linseed-meal poultice containing $\frac{1}{5}$ part of mustard to the epigastrium for six or eight hours. The withholding of food is readily submitted to, as there is complete distaste for nourishment of every kind. It is judicious, however—more, perhaps, for the sake of the friends than for the benefit of the patient—to make use of a nutritive suppository several times in the day.

While the vomiting goes on, the washing bath must, of course, be discontinued, for so sensitive does the patient become to impressions of cold, that the smallest exposure tends to keep up the derangement. It is best to forbid washing of any kind except sponging of the face and hands, and to keep the child in bed with a hot bottle to his feet and a layer of cotton-wool over his abdomen and chest. For medicine he may take the sulphate of zinc mixture recommended above, increasing the dose of the sulphate to $\frac{1}{10}$ or $\frac{1}{8}$ gr.; or use, as alternatives, any of the other remedies which have been suggested.

When vomiting ceases, weak veal or chicken broth, with rusk or dry toast, can be given; afterwards, as the appetite improves, an ordinary diet can be returned to, but the change must be made cautiously and by gradual steps.

These attacks almost always occur in children who are suffering from an acute post-nasal catarrh, and are the consequence of the passage of septic mucus into the child's stomach in large quantities. If the fauces be inspected, the mucous membrane at the back of the pharynx will be found to be red and thickened, looking like red velvet, and glistening with moisture. Often gelatinous yellowish mucus can be seen adhering to the surface or creeping slowly downwards. It is important to treat this condition without delay. The throat should be painted twice a day with glycerin of boric acid, and a few drops of a solution of resorcin in normal saline solution should be instilled into each nostril three times a day and allowed to gravitate downwards into the throat. The attacks are accompanied by a rise of temperature, which may reach 103° or higher on the first day, and the liver is generally congested. If it can be felt to be obviously enlarged, an aperient dose of calomel should be given as soon as the stomach can keep it down.

In cases where the attacks occur, as they may do, at regular intervals—every few weeks or months—they are often spoken of as periodic or cyclical vomiting. This and the form of vomiting which is dependent upon pyloric obstruction are treated in separate articles.

Eustace Smith
(Revised by R. Hutchison

VOMITING, CYCLICAL ('Fitful', 'Periodic', 'Recurrent', 'Lithæmic', or 'Bilious Vomiting', 'Vomiting with Acetonæmia', 'Migrainous Gastric Neurosis', 'Food Fever', 'Acid Intoxication').—Recurrent attacks of vomiting, with or without pyrexia and headache, often associated with the odour of acetone in the breath, and its presence in the urine, together with diacetic and β-oxybutyric acids, are not uncommon in children between three and eight years of age. Such attacks have been described under each of the above titles, but probably all are not of similar nature, neither is their causation always the same. They are most common in neurotic, highly-strung, precocious children. A family history of gout, rheumatism, 'bilious headaches', migraine, and various functional neuroses is often ascertained.

Predisposing causes, in some cases, seem to be an indoor life and want of exercise, chronic constipation, emotional excitement, mental or physical fatigue, or a diet excessive in fats or carbohydrates. In a few cases, eye-strain due to ametropia may predispose to periodic attacks of vomiting and headache. Sometimes a neurotic disposition and a tendency to vomit on slight provocation seem alone accountable, and the attacks resemble and are in after-life replaced by, migraine.

Diagnosis of Cyclical Vomiting with Acidosis.—A history of previous similar attacks is usually forthcoming. In primary attacks, the possibility of ptomaine poisoning, acute indigestion and gastritis from overfeeding, gastric influenza, appendicitis, intussusception, intestinal obstruction, renal colic, and meningitis should be borne in mind

Operations for non-existing appendicitis have been performed in some cases of cyclical vomiting; but sometimes, as Comby maintains, recurrent and subacute appendicitis may be the real cause. Inquiry as to diet will perhaps lead to the diagnosis of 'food fever', and observation of the patient's demeanour and surroundings may suggest a purely neurotic origin of periodic headache and vomiting. Eye-strain rarely, and migraine commonly, account for such attacks. The absence of acidosis distinguishes the neurotic variety from true cyclical vomiting.

Treatment of Cyclical Vomiting :—

Prophylaxis.—When there is sufficient evidence of habitual excess in fats and carbohydrates in the diet, periodic attacks of vomiting, headache, and pyrexia may sometimes be prevented by prescribing a simple mixed diet without excess of the articles named. In some cases, however, the causes of the attacks cannot be thus explained; their origin seems to be in hepatic inadequacy, often associated with chronic constipation. The bowels should be regulated by rhubarb and soda, grey powder, or occasional doses of calomel followed by a saline draught. The success which some have claimed for prolonged treatment by alkalis has not been shared by the writer. For cases of purely nervous or hysterical origin, a quiet and unemotional life led in the open air as much as possible, should be prescribed. Separation from relatives and a careful selection of associates and environment are often advisable.

Prodromal symptoms are often absent in cases of cyclical vomiting, but when they occur, calomel $\frac{1}{4}$ gr., with sodium bicarbonate 5 gr., should be given half-hourly until six doses have been taken, and be followed half an hour later by a saline laxative. During an attack, the incessant vomiting usually renders all medication by mouth useless. Sips of hot water may be given every quarter of an hour, or ice to suck, and hot fomentations should be applied to the epigastrium. A twenty-four hours' fast is usually obligatory, but when vomiting shows signs of abatement, small quantities of albumen-water, barley-water, whey, or peptonized milk may be supplied. The lower bowel should be unloaded at the onset by means of a water enema.

In prolonged cases rectal alimentation may be necessary, and saline injections, to which bromides in $\frac{1}{2}$- to 1-drachm doses may be added when there are much restlessness and mental distress. The prognosis is almost invariably favourable unless the symptoms follow anæsthesia. In the latter case, as mentioned elsewhere, the fatality is probably the result of toxæmia of intestinal origin, and the same may be said of fatal cases of spontaneous cyclical vomiting. In instances of this kind the value of salol and other intestinal disinfectants is problematical. By the time that their employment is considered necessary, the disease has already advanced beyond control. (*See also* Acidosis.)

Leonard G. Guthrie.

VOMITING, HYSTERICAL.—In a case of hysterical vomiting the patient should be isolated and psychotherapy undertaken. This should always be preceded by a thorough physical examination, supplemented by radiography. It should then be explained to the patient that there is no organic disease, but that the vomiting is the result of some previous irritation, disease, or emotion which has now passed off, and that the vomiting has become habitual because he believes that he is still suffering from some condition which necessitates it. When the patient has been thoroughly persuaded of the truth of this view, he should immediately be put upon a full ordinary diet, which he will usually keep down, although a little encouragement may be necessary on a few subsequent occasions. Rapidity is of the essence of success. (*See also* Hysteria *and* Psychoneuroses). *Robert Hutchison.*

VOMITING OF PREGNANCY.—(*See* Pregnancy, Disorders of.)

VULVO-VAGINITIS, as it occurs in little girls, is a most obstinate disease, and requires careful and prolonged treatment. At the outset it is important to ascertain by bacteriological investigation whether it is the simple or the gonorrhœal form of the affection that one has to deal with.

In *simple* cases the parts should be thoroughly irrigated two or three times daily with an antiseptic solution (saturated boric acid, 1–4000 permanganate, or 1–5000 perchloride). The solution should be applied with a syringe or a swab, and gauze soaked in it may be

left in contact with the mucous membrane. The surrounding skin should be protected by white precipitate ointment (5 gr. to the ounce). In the more severe cases silver solutions (1 to 10 per cent protargol or argyrol) may be used instead of the above lotions. Suppositories containing 1½ gr. of salol in cocoa-butter may be introduced into the vagina two or three times daily. General cleanliness should be strictly observed, and the use of a sulphur bath every other night is often helpful. The general health should be built up by tonics, and local treatment continued for a month after all discharge has ceased.

In the *gonorrhœal* cases treatment must be even more energetic. It must be remembered that this form of the disease is highly contagious, and the patient should therefore be strictly isolated and the utmost care taken to prevent the carrying of infection by napkins, washing utensils, sheets, etc. All such articles should be thoroughly disinfected before being washed. The local treatment is the same in principle as that employed in simple cases, but stronger antiseptics are required (e.g., perchloride 1–2000, protargol 5 to 10 per cent, argyrol 5 to 25 per cent). Perrin uses a 10 per cent solution of protargol in glycerin (protargol 5, water 8, glycerin q.s. ad 50) applied to the vagina and cervical canal by means of cotton-wool; if the urethra is affected it should also be applied to the urethral canal by means of a urethroscope. A compress of 1 per cent protargol is applied to the vulva for a few minutes three or four times daily. A diaper or pad should be worn to prevent the child carrying infection to the eyes. Quarantine should be continued for some time after all organisms have disappeared from the discharge.

In the gonorrhœal cases treatment by a stock vaccine has lately been strongly recommended. An injection of 50 million may be given at any age over six months, the best site being the muscle of the outer part of the front of the thigh, and repeated every fifth day, increasing the dose by 10 million each time. After five injections have been given the interval may be increased to ten days. If necessary the dose may be raised to one of 200 million. *Robert Hutchison.*

WARTS.—Recent experimental work has demonstrated anew the infectivity of warts. Treatment is conditioned by the position, character, and number of the lesions present. Large single warts in sites where scarring is not important are most quickly removed by excision; single warts on the face and on the scalp are better treated by other means. When small, and of recent appearance, the best cosmetic results are obtained with electrolysis, the base of the wart being pierced in all directions with the negative needle, until the whole surface is blanched. Larger warts may be more conveniently treated by carbon-dioxide freezing, care being taken to keep the stick of snow accurately applied to the eminence of the growth, which must be frozen throughout its extent, but without involving healthy skin. With these precautions, exposure may be from one to three minutes, the shorter time being recommended at first. Ionization is a very successful means of treating large, flattish warty patches: the positive electrode, covered with several layers of gauze soaked in a 2 per cent solution of magnesium sulphate, is applied to the surface to be treated for ten to twenty minutes, a current of 5 to 15 ma. being used according to the size of the site. Good results may also be obtained by applying certain caustics, trichloracetic acid being one of the best. Nitric acid is very effective, painted carefully on the wart with a glass rod, but it frequently leaves unsightly scars.

Where the warts are too numerous for these methods to be conveniently applied, radiotherapy may be cautiously essayed, or internal remedies given, a great variety of which have been recommended by individual observers from time to time; among these may be mentioned the administration of moderate doses (½ to 1 drachm ter die) of Epsom salts, and more recently, the giving of a pill of hydrargyri iodidum viride, ¼ gr., three times a day for an adult, proportionally smaller doses for a child. *E. Graham Little.*

WEIR-MITCHELL TREATMENT.—(*See* NEURASTHENIA.)

WHITLOW.—The suppurative condition of the fingers known as whitlow or felon usually results from a punctured wound with a septic instrument, or is due to subsequent infection of a simple cut.

It is usual to speak of four different varieties of whitlow, which depend upon the depth of the infection ; and as the particular variety met with in a given case may require special treatment, all four will be alluded to under their respective headings.

1. *Subcuticular.*—The pus collects beneath the epidermis ; there is often an exudation of blood-stained serum with very little pus, and the epidermis may be stripped up for some distance from the underlying dermis.

2. *Subcutaneous.*—In this form the infection tracks into a deeper level, and the tough tissue of the finger pulp becomes attacked. It is excessively painful, owing to the tension produced, and if neglected may lead to the following varieties.

3. *Thecal.*—This is a suppurative tenosynovitis. The synovial membrane which accompanies the tendons along the flexor sheaths becomes infected, and the whole canal may in this way become filled with pus. In the case of the thumb and little finger the results may be still more serious, owing to the communication which usually exists between the synovial membranes of the flexor sheaths and the great synovial membrane or palmar bursa which envelops the flexor tendons in the palm. Fortunately this accident is rare, but its occurrence is a very serious matter, often leading to destruction of the hand and permanent crippling.

The flexor sheath cannot be said to extend beyond the distal extremity of the second phalanx, so that whitlows which are confined to the region of the terminal phalanx and carefully treated should not give rise to this complication.

4. *Subperiosteal.*—In this form the infection gives rise to a periostitis, the periosteum of the terminal phalanx being attacked and necrosis of the bone a common result. The intimate connection of the skin and periosteum by the fibrous ligaments which traverse the superficial fascia favours this result.

General Treatment.—This consists in incising the tense and suppurating area as soon as possible, in providing rest for the affected finger by a suitable splint, and in the application of antiseptic dressings. But while these directions appear sufficiently simple, it will be necessary to elaborate them according to individual cases.

In the subcuticular variety, which is practically painless owing to the pus lying superficial to the sensitive papillæ, a free opening can be made without any anæsthetic, and all undermined skin can be snipped away with scissors without the least discomfort to the patient.

The subcutaneous form is more difficult to treat, and it may be said at once that the causes of failure are usually an insufficient incision and the absence of rest to the part. It often happens that an incision has to be made without an anæsthetic, and the timidity of both the operator and his patient results in an insufficient opening being made. Although with thorough local anæsthesia the operation may be quite satisfactory, it is always advisable to give a general anæsthetic when possible.

In making the incisions into the swollen infected area, three precautions must be taken : (1) To see that the opening is adequate, so that the pus can discharge freely. This is not so easily achieved. Owing to the dense fibrous tissue in the part, as soon as the greater part of the exudation has been let out, the edges of the wound tend to close, and there is retention of the pus. To obviate this it is recommended that two elliptical incisions be made and a portion of skin and subcutaneous tissue excised so that the pulp is freely opened up, and sloughs should be carefully removed with a spoon. (2) Care should be taken in making the incision that the flexor sheaths be not damaged. This precaution is very necessary, for it has often happened that an energetic operator, with the above rule in mind, has carried his incision right down to the synovial membrane of the sheath, and has caused an infection of it. (3) The finger should be rendered ischæmic by a suitable tourniquet, so that the operation may be undertaken with a clear field of vision and at leisure.



Fig. 82.—Incision of finger tip for whitlow.

When the pulp of the finger is swollen and tense, excellent drainage is obtained by making a free incision through the tissues of the finger tip as in the formation of an amputation flap (*see Fig.* 82). A palmar flap is thus formed which drops away from the phalanx and allows of the most free drainage. A small strip of rubber tissue inserted between the surfaces keeps the wound open. By this method the sensitive nerve-endings

are not involved in the scar, and the flap will fall back into place when the infection has subsided, without much deformity being left.

In the thecal form free incisions will be required opposite the centre of the second and first phalanges ; either central or lateral incisions may be made. If the latter, care should be taken to see that they do not damage the digital nerves. Under no circumstances should longitudinal incisions extend along the whole length of the digit across the flexures ; not only is such an incision unnecessary for the purpose of drainage—short incisions opposite the middle of the phalanges do quite well—but the long continuous incisions tend to become keloid and lead to secondary contraction.

If the pus tracks into the palm, a palmar abscess may require opening, and this can often be done by incision of the interdigital space, followed by a director or sinus forceps pushed into the palmar bursa ; in this way crippling incisions of the palmar tissues are avoided.

If it became the custom to operate on cases of whitlow under a general anæsthetic with *deliberation* and *anæmia*, many fingers would be saved that are irretrievably ruined by hurried and inadequate operations.

The subperiosteal form is treated in the same manner, but subsequently it will be necessary to remove the necrotic bone.

The After-treatment is of much importance. Fomentations and baths of weak antiseptics are of undoubted value, but they are often overdone. It is rarely that a whitlow requires fomentations for more than three or four days, and much harm results from allowing the tissues to become sodden and unhealthy from too much water treatment. In favourable cases a dry dressing may be applied in the first week ; and as soon as pain has disappeared, gentle passive movements of the fingers should be undertaken to break down the adhesions which have a tendency to form in the thecal variety. Bier's treatment by passive congestion or suction is of distinct value.

Unfortunately, the result is too often a stiff and useless finger which may require amputation. But this must be looked upon as a last resort. It is true that where the process tends to spread, and where there is a risk of infection of the hand and arm, amputation must be seriously considered, and again, where after careful treatment a useless appendage remains ; but while it is impossible to lay down absolute rules for these cases, it should be clearly understood that amputation is only called for in the acute stages to avert a more serious condition ; and even where the finger appears totally and irretrievably destroyed, it is much better to wait until the suppurative process has subsided before venturing on the amputation. By such a course the free opening up of lymphatic spaces in the presence of acute infection is prevented, and the surgeon is often able to save some part of the finger in the form of a stump which will be of service to the patient. It is astonishing how often a bad suppurative condition of the fingers results in an almost complete cure.

The above remarks apply to the whitlows met with on the palmar aspect of the digits, but the allied condition on the dorsum—**Paronychia**—is to be treated on similar principles, plus the free removal of the nail. *W. H. Clayton-Greene.*

WHOOPING-COUGH.—The following contribution is based on the careful study of over 550 cases which have been under the writer's care in the whooping-cough ward at the Hospital for Sick Children, Great Ormond Street.

The treatment of whooping-cough constitutes one of the reproaches to the art of medicine. We have no method by which we can shorten the disease, nor can we do more than pilot the case to recovery, modifying symptoms, guarding against complications, and making our patient as comfortable as we can during an illness which has no rival in its discomforts. A specific for whooping-cough has yet to be found. To all those I have tried (and they are over thirty in number), the handwriting on the wall is literally applicable : ' Tekel ' (" Thou art weighed in the balances, and art found wanting "). Nevertheless, much can be done to alleviate the sufferings of the patient, both by general management and by the use of suitable drugs.

Treatment can be best considered under the heads of (1) General hygienic management ; (2) Special drug treatment ; and (3) The treatment of complications.

1. **General Hygienic Treatment.**—As soon as the disease is recognized, the patient

should be isolated, and two rooms should be set apart for occupation by the patient and his attendant. The rooms should communicate with one another, or at least be on the same floor, and should be freed from superfluous furniture and hangings. If gas is laid on, the presence of a ring burner will be found of great utility, both for the preparation of food and for the vaporization of medicaments. One room should be kept as the day, the other as the night room. Carpets are not desirable in the sick-room, and in the absence of a cork linoleum floor covering, a waxed drugget, properly lined, should cover the whole floor. Nothing, however, is so suitable as cork linoleum, which is warm to the feet, quiet to walk on, and can also be readily cleaned with antiseptic solutions.

In the case of infants and small children, the cot should have a side which can be let down next to the nurse's bed, up to which it must be drawn. The nurse is then able to attend to the child without having to get out of bed. Cots with fixed high sides must be discarded. A bed-board or bed-table will be found most useful, not only as a support against which a child can lean during paroxysms of coughing or vomiting, but also as a place where he can always find a vessel into which he can vomit or expectorate, and where he will find a handkerchief, or rather its equivalent.

Preparation in the way of draw-sheets must also be made, as the involuntary passage of urine and motions during the paroxysms of coughing or vomiting is very common. On this account, older children also may be pinned up with a napkin. Because of this liability to accidents, the use of combination sleeping-suits is to be condemned, and a flannel night-gown or pyjamas should be adopted. Nothing tight should be worn around the neck. When it is impossible to provide a special attendant for the patient, it is most desirable that those who come in contact with the infected children should, when in the sick-room, wear an overall garment of a washing material, preferably glazed holland.

Precautions against infection and reinfection should include the disinfection of all vessels, cups, dishes, and utensils used by the patient, before they leave the sick-room. All accidental contamination of floor or clothing by vomited material should be rectified by the use of antiseptic solutions (carbolic acid 1–40, izal, sanitas, formalin), and hand-kerchiefs should be replaced by small squares of linen which can be burnt after use or by pledgets of absorbent cotton-wool. In older children, an enamelled basin (not an earthenware one) will be found most useful when vomiting is at all frequent. Its use not only makes for cleanliness, but affords a sense of security which is not unimportant in nervous children.

Ventilation.—Both rooms should be well ventilated and be capable of being thoroughly aired, but it is not advisable to adopt, in the early stages of the disease, what is now called the 'open-air treatment'. Ventilation is essential, but the reduction of the temperature of the room below 60° F. is not advisable, and tends to increase the liability to bronchial catarrh and bronchopneumonia. On the other hand, it must be borne in mind that the temperature of the room is apt to become unduly raised by the means employed for the production of vapours used therapeutically. In the earlier stages, and as long as there are signs of bronchitis, the patient should be kept to the two rooms: but in warm weather, if the attack be not a severe one, there is no need to keep the child to the house, provided he does not associate with other unprotected children. In towns, the practical impossibility of isolation except within the house, makes it advisable to keep all cases of whooping-cough confined to the house during the first three or four weeks of the developed disease.

A recognition of the increased liability to pulmonary catarrh during and after whooping-cough, should make us insist on the careful clothing of children during convales-cence. Both arms and legs should be kept covered. Prudence and not fashion must regulate the clothing.

Diet.—On account of the severe gastric disturbance, which is so marked a feature of many cases of whooping-cough, attention to the diet is essential. It must be light and nutritious. The meals must be small and frequent, and when vomiting is at all marked, considerable discretion as to the amount, character, and frequency of the feeds must be exercised.

In the early stages, the diet should consist of milk duly diluted with barley-water, water, or lime-water, of animal broths, milk puddings, jellies, custard, and eggs. When the febrile stage is subsiding, fish and minced or pounded meat may be given, but all rich

foods are to be forbidden. If vomiting is severe, iced milk, malted milk, peptonized milk, milk and soda-water, or albumen-water may be tried; but when these are not retained, nothing is so useful as meat-juice. This, in cases of extreme exhaustion, may be administered every quarter or half hour in 15- to 20-min. doses in a dessertspoonful of water. Sanatogen or plasmon may be used temporarily where milk is not tolerated, and if emaciation is marked, plasmon or virol may be tried.

2. Drug and Vaccine Treatment.—Perhaps for no disease have so many preparations been claimed to be curative as for whooping-cough. No one drug can claim in any sense of the word to be a specific. A serum prepared by Dr. Leurieux was tried by me in three cases, without producing the least beneficial result.

The treatment can be divided into (*a*) Local; (*b*) General or internal; (*c*) Vaccine treatment.

a. Local.—Of these applications, undoubtedly the most useful are various inhalations. These are best administered by means of vaporizers, which cause the atmosphere of the room to become permeated with the medicament. Carbolic acid or cresolin I have found most useful. Cresolin has the advantage that it does not require such an aqueous vapour for its diffusion, and consequently the atmosphere is drier, while the risks of scalding or of accidental poisoning with carbolic acid are fewer. Cresolin is vaporized by means of a small lamp.

Creasote may be used either in a kettle, or sprinkled on a towel hung in the vicinity of the bed. The vapour is unpleasant and irritating. Creasote may be used in combination with other volatile disinfectants, as thymol, eucalyptol, carbolic acid, by sprinkling these on absorbent wool and then enveloping them with cotton-wool and gauze, so that the irritant material cannot come in contact with the skin. With some such preparation balls, dolls, and other toys may be stuffed. Ten drops of the following preparation may be employed in this manner:—

℞	Thymol	ʒiss	Olei Caryophylli	ʒij
	Creasoti	ʒiiss	Ætheris Acetici	ʒiv
	Acidi Carbolici Puri	ʒij		

Ten drops on cotton-wool as an inhalation.

Turpentine, thymol, terebene, or eucalyptol may also be used as inhalations, in the strength of 1 drachm to 3 oz. of spirit and 7 oz. of water.

Many writers have advocated the employment of local applications to the mucous membrane of the throat, nose, and larynx by means of sprays or douches, or by direct application. I cannot speak at all favourably of any of these methods. Steam sprays are risky, and frighten children. Hand sprays are much less objectionable, but the results obtained from their use are quite incommensurate with the trouble, upset, and frequent aggravation of coughing and vomiting which too often attend their use. Painting the throat is useful if we wish to excite vomiting, but, apart from this, even applications of perchloride of mercury, repeatedly used, with the object of exercising germicidal influence on the suspected organisms of whooping-cough, have proved utterly useless at my hands. Cocaine has been used for its anæsthetic effects on the respiratory mucous membrane, and it is said with good effect, but it is far too risky a drug to employ without the greatest circumspection, on account of the susceptibility of some children to cardiac syncope from quite small doses of cocaine. Removal of enlarged tonsils or of adenoids is frequently of the greatest benefit to the patient, especially in the later stages of the disease, and I have seen obstinate cases promptly subside after the operation. Many a case of whooping-cough is unduly protracted by the omission to attend to this requirement.

While local applications to the throat are of little service, applications to the chest are most useful. Liniments produce local hyperæmia, some of their constituents are absorbed, the volatile constituents are inhaled, and in addition, the rubbing of the child's chest improves its musculature. Turpentine liniment is the most useful; another not unpleasant one is the following:—

℞	Olei Carui		Olei Eucalypti	2 parts
	Olei Succini	āā 3 parts	Linimenti Camphoræ	24 parts

M. Ft. lin. To be rubbed on the chest night and morning.

The chief indication for the use of liniments is the existence of bronchial catarrh or of collapse of the lung.

If the child is very weak or drowsy, and has extensive bronchopneumonia, a turpentine stupe should be given after the chest has been rubbed with vaseline.

After the application of a liniment, the chest should be covered with a cotton-wool jacket, which should be worn during the day, to be exchanged for a similar one, put on after the evening rubbing and worn during the night.

Recently, applications of fluorine have been recommended, but I understand from those who have tried them that they are unable to substantiate the exaggerated claims made as to their utility.

b. Internal.—The treatment of whooping-cough by internal medication can be divided into that of the catarrhal and of the paroxysmal stages, and that of decline and of convalescence.

In the catarrhal stage, the drugs of most use are the expectorants: ipecacuanha; carbonate, chloride, and acetate of ammonia; iodide of potassium; spirits of nitrous ether; squills. In this stage, phenazonum (antipyrin) or citrophen is often of use. When the secretion in the bronchi is thick and tenacious, as evidenced by the sticky râles, iodide of potassium in 1- to 3-gr. doses is useful, but chloride of ammonium and apomorphine have both proved of little use in my experience.

In the paroxysmal stage the drugs which are most likely to be useful are phenazonum, a combination of iodide of potash and chloral hydrate; glycerin of carbolic acid, and bromoform. In some cases diamorphine hydrochloride, belladonna, and bromides and cannabis indica have been useful, but for none of them can a specific action be claimed. As a routine treatment the following mixture may be given:—

℞				
	Phenazoni	gr. iij	Vini Ipecacuanhæ	
	Potassii Iodidi	gr. ij	Spiritus Chloroformi	ää ℥v
	Ammonii Carbonatis	gr. j	Aquæ Menthæ Piperitæ	q.s. ad ℥ij

For a child seven years old. Two teaspoonfuls to be taken every six hours.

Chloral hydrate has been much more useful in combination with iodide of potash then when given alone, possibly from the formation of chloral alcoholate.

Should vomiting be a marked symptom, a combination of 1 to 3 min. of glycerin of carbolic acid with 5 gr. of carbonate of bismuth is most useful.

Belladonna, which is perhaps the drug most commonly used in the treatment of whooping-cough, has proved in the majority of cases of very little, if any, use; but here and there cases are met with in which full doses of belladonna do seem to control the severity of the attacks. Cannabis indica has yielded just as satisfactory and unsatisfactory results as belladonna.

Intramuscular injections of ether given into the buttock, in doses of 1 c.c. for a child under one year of age and of 2 c.c. above that age, and repeated every other day for four to six injections, are said to have a markedly beneficial effect on the severity of the symptoms and the duration of the disease.

Should the paroxysms be very severe, a whiff of chloroform vapour will be found to be the best method of relieving them. Among the drugs tried, but which did not give definitely satisfactory results, were bromides, quinine, aristochin, drosera, grindelia, tinct. blattæ, salol, benzol, antimony, allylic carbide (yadil), alum, arsenic, perchloride of mercury, pilocarpine, and apomorphine.

Bromoform in doses of 5 min. is sometimes useful, but it must be remembered that on exposure to the light it decomposes and becomes inert, and, what is much more serious, is very apt to separate out of the mixture containing it, and settle at the bottom of the bottle; and the patient, in more than one case which has come under my notice, has received a toxic, though fortunately never a fatal, dose from the bottom of the bottle.

When pulmonary catarrh is persistent, creasote is often of great use, and in combination with bismuth acts most beneficially in cases of chronic intestinal catarrh.

During convalescence, nothing has proved so useful as cod-liver oil, given either with iron or with maltine. Quinine is much more useful during convalescence than during the acute period of the disease. Most of the iron preparations are useful during

convalescence. When emaciation has been marked, the addition of plasmon or somatose to the food may be tried, or virol added to the diet.

Change of air is perhaps the best restorative, but the necessity for protection from exposure to cold must be impressed on parents and nurses.

c. Vaccine Treatment.—A vaccine prepared from pure cultures of the Bordet-Gengou bacillus has been given in doses commencing with 5 million, followed two days later by 2½ million, and then with increasing doses every second day till a dosage of 20 million is reached; and it is claimed that this treatment affords relief to symptoms, protection against infection, and shortens the course of the disease.

Inoculation with mixed vaccines, however, seems to have given better results than those obtained by the use of the Bordet-Gengou bacillus in pure culture. The vaccine most favourably reported on is a mixture of 50 million Bordet-Gengou bacilli, 20 million *Staphylococcus aureus*, and 20 million *Micrococcus catarrhalis*. To these some add 5 million *Streptococcus pyogenes* and 5 million *Bacillus influenzæ*.

The injections are given every other day in quantities of 50 million in moderately severe, and 100 million in very severe, cases.

A comparison of cases treated by drugs, by a pure culture of the pertussis organism, and by the mixed vaccine, showed that the drug-treated cases lasted 7 to 12 weeks, the pure vaccine cases 4 to 4½ weeks, and the mixed vaccine cases 3 to 3½ weeks.

The variable severity, duration, and complications of whooping-cough, and the optimism of the vaccine therapeutists, compel us to regard the efficacy of vaccine therapy in this disease as still *sub judice*.

3. **Treatment of Complications.**—Most of these should be treated as if the whooping-cough were not present, bearing in mind, of course, the risk which attends the use of sedatives in acute bronchial affections.

When there is much collapse of the lung, and the chest walls are unduly yielding, as in cases of rickets, I have succeeded in improving the thoracic breathing by applying a Martin's rubber bandage over the abdomen, so as to limit the abdominal and encourage the thoracic movements of respiration. The tightness of the bandage requires careful graduation, and it should be applied only intermittently at first; but after a time it will be found that the child tolerates it quite well. In such cases, rubbing the chest is a necessary adjunct to the use of the bandage.

Sublingual ulcers, which are surprisingly painless, are best painted with a solution of ½ drachm of salol in 2 drachms of glycerin and 1 oz. of rectified spirit. Should they spread, they are best treated by touching with solid nitrate of silver. Sores about the nose and mouth are often very tiresome and painful. In treating them, preparations containing glycerin should be avoided, as should ordinary vaseline. Lanolin may be used, or white vaseline, which should form the basis of ointments used for the lips and nose.

The treatment of hæmorrhage, of subcutaneous emphysema, of hernia and prolapse, and of dilatation of the heart, calls for the addition of sedatives, but otherwise is conducted on the same lines as if no whooping-cough existed, except that operative procedures for the cure of hernia must be postponed. Empyemata should be opened and drained without delay. The liability to pulmonary tuberculosis, during and after an attack of whooping-cough, calls for the exercise of special attention to general hygienic measures, directed towards the prevention of infection with tuberculous material.

Isolation should be maintained for six weeks, and although for some months after an attack of whooping-cough a child on catching cold will have a paroxysmal cough and will occasionally whoop, yet such cases do not call for isolation. *Arthur Francis Voelcker.*

WORMS, INTESTINAL.

Tapeworms.—The treatment of tapeworm is very apt to be unsatisfactory unless it is taken in hand seriously, suitable preparation of the patient being of the first importance. The following plan will usually prove successful:—

For three days prior to the administration of the anthelmintic the patient should be kept in bed on a liquid diet, a pint and a half of milk and of beef-tea being sufficient. A mixture containing 20 gr. of sodium bicarbonate, 1 drachm of sodium sulphate, 20 min. of spirit of chloroform, in 1 oz. of peppermint water, should be given thrice daily. On the third night a draught should be given containing ½ oz. of magnesium sulphate with

1 drachm of tincture of jalap and 20 min. of compound tincture of chloroform in 1 oz. of water. This should be repeated at 7 o'clock next morning if the bowels have not acted. At 8 a.m. 1 drachm of the liquid extract of male fern made up with 1 drachm of mucilage of tragacanth and 1 drachm of syrup of ginger in 1 oz. of chloroform water should be given. At 9 a.m. this dose should be repeated. At 11 a.m. ½ oz. of castor oil with 1 drachm of tincture of jalap should be given, and if the bowels do not act within an hour a soap-and-water enema should be administered.

The motions should be passed into warm water in a vessel lined with black crêpe to facilitate the recognition of the head.

An alternative method is as follows: Rest in bed on a diet of beef-tea and rusks for 3 days, 2 gr. of extract of cascara being given thrice daily. On the fourth day at 5 a.m., 1 oz. of compound senna draught should be given, followed at 9 a.m. by 15 min. of extract of male fern in capsule, this dose being repeated at intervals of a quarter of an hour for other three doses. At 11 a.m. the senna draught is again given.

The proprietary preparation, oil of filmaron, which is the active principle of male fern dissolved in castor oil, may be given instead of the extract of male fern. The dose is 1 oz. for an adult, and there is no need for a purgative after it. It is specially suited to children.

Other anthelmintics are the following: (*a*) Pelletierine tannate (the active principle of pomegranate) 8 gr.; (*b*) 1 to 2 min. of croton oil shaken up with 1 drachm of chloroform and taken in half a tumblerful of milk in the early morning fasting.

Round Worms are best treated with santonin, which should be given on an empty stomach, combined with an aperient such as scammony, calomel, or castor oil, e.g.:—

℞ Santonini	gr. iiss	Hydrargyri Subchloridi	gr. ss
Pulv. Scammonii Compositi	gr. ij		

For a child of one year.

℞ Santonini	gr. v	Syrupi Simplicis	℥j
Olei Ricini	℥ss	Aquæ Menthæ Piperitæ	ad ℥ij
Mucilaginis Acaciæ	℥iv		

Fiat haustus. For an adult or a child of twelve.

Threadworms.—The presence of threadworms is usually an indication, in children at least, of an unhealthy state of the large bowel, and especially of an excessive secretion of mucus. This may be remedied by cutting down the starchy foods (*see* DYSPEPSIA IN CHILDREN) and by giving a mild aperient every night consisting of a grain of grey powder with 3 or 4 gr. of rhubarb powder. In many cases these measures are sufficient to effect a cure, but in more obstinate cases one can have recourse (1) to vermifuge drugs or (2) to local treatment.

1. Amongst the *drug treatments* which have been recommended are the following:—

a. A daily dose of an aperient sulphate water, e.g., Hunyadi.

b. A morning dose of 2 oz. of compound decoction of aloes before breakfast, with a pill of 2 gr. of extract of quassia (keratin-coated) at night. Next day the pill should be repeated after each meal, and the aloetic purge given again on the third morning. The pills should be continued for a few days if worms are still present in the stools. This treatment is specially suited to adults, and throughout its course the diet should be rather spare.

c. Petroleum emulsion (B.P.C.) in drachm doses three or four times a day.

d. Santonin, 1 gr.; aloes and iron pill, 1½ gr. (silvered), one every night for six nights, suitable for a child.

e. Oil of male fern, given in the same way as for tapeworm.

f. Sulphur, in doses of 9 gr. daily for an adult and 1½ gr. three times daily for a young child.

2. *Local Treatment*:—

a. Enemata of salt and water (1 tablespoonful to a half pint) given warm after the bowel has been emptied. A pint and a half may be given to an adult every other night. For a young child 6 oz. will be sufficient. The enema should be run in through a funnel and tube, the pelvis being raised.

b. Enemata of infusion of quassia or garlic, with or without the addition of salt, used as above.

c. The following enema : Oil of turpentine 2 drachms, santonin 2 gr., starch mucilage 6 oz. Injected every other night for a week.

d. A small portion of unguentum hydrargyri inserted into the rectum every night.

e. Suppositories of strong mercurial nitrate ointment, 7½ gr. One to be inserted every other night at bedtime. For children below the age of four, a smaller suppository may be used.

f. Suppositories containing 3 gr. of santonin, one to be inserted every second or third night for a week.

A little weak white precipitate or nitrate of mercury ointment may be applied locally for the relief of itching. As a prophylactic measure strict cleanliness should be practised, the hands and nails being washed to prevent reinfection. Salads, watercress, and other raw vegetables should be avoided.

In very obstinate and old-standing cases in adults, the adoption of a strict diabetic diet for a few weeks sometimes gives good results. *Robert Hutchison.*

WOUNDS.—In this article will be considered the treatment of accidentally-inflicted wounds affecting the soft parts. Compound fractures, penetrating wounds of the joints, chest, abdomen, etc., are dealt with under appropriate headings.

The two first duties of the practitioner are to take the necessary steps to combat or avoid the occurrence of shock and to arrest hæmorrhage.

Shock.—It is only possible here to touch briefly on the practical aspect of this wide subject. It is convenient to speak of primary and secondary shock. *Primary shock* ensues practically at once upon receipt of a severe wound. It is not possible to avoid its occurrence. If adequate means be taken to combat it, the patient may recover from it and secondary shock may not follow. In the worst cases, or where no treatment has been available, it passes into a condition of secondary shock, with or without a period of rallying and partial recovery. *Secondary shock* comes on later. It may be a sequel of primary shock or come on *de novo*. It is produced by various factors which will be enumerated, and to a considerable extent may be avoided by adequate treatment. The factors which cause primary shock to pass into secondary shock, and those which cause secondary shock, are largely identical. They are—cold and exposure, lack of food and drink, hæmorrhage, pain, and disturbance. The patient should therefore be well covered with blankets : they are needed beneath him as well as over him. Hot-water bottles, readily improvised if need be, are placed round him. Hot drinks are given. Care and gentleness are exercised in moving the patient, and splints are applied to limit pain during transport. Morphia (¼ gr. hypodermically) should be given, but not rashly repeated. Since it is obvious that in a severe wound, such as we are now considering, careful operative treatment under an anæsthetic is called for, disturbance of the wound at this stage is to be avoided except in so far as it is necessary in order (1) to arrest hæmorrhage, and (2) to protect it from further contamination. The patient is got to bed as quickly as possible. Still avoiding exposure, he is placed between hot blankets, and hot-water bottles or a hot-air bath (made by slinging an incandescent electric bulb in a bed-cradle) arranged. The foot of the bed is kept elevated. Hot saline may be given by the rectum, or subcutaneous saline infusion is instituted. Absorption by these routes in cases of severe shock is, however, very slow, and when the blood-pressure has fallen near the danger point they are of little avail. In cases not readily responding to this treatment, intravenous injections should be given. The best is blood. Failing this, gum solution may be substituted (750 c.c. of a 6 per cent solution of gum arabic in normal saline.) This can be obtained sterilized in air-tight bottles and brought to the necessary temperature by immersing the bottle in hot water. Should neither be available, normal saline should be employed, and, though its effect is liable to be transitory, it is of great value in tiding the patient over a critical period. Small amounts are of little use : some pints are necessary.

Hæmorrhage.—When profuse bleeding is taking place from an extremity, a tourniquet may be applied as a temporary measure. There is not the same objection to the use of a tourniquet as obtained in warfare. In the latter, many hours might elapse before the tourniquet could be removed, and gangrene was a frequent sequel ; but as a temporary measure,

to arrest hæmorrhage until proper surgical treatment can be undertaken, a tourniquet is justified. In hæmorrhage from the head or neck, or in other regions where it is impracticable to use a tourniquet, digital compression of the main arterial trunk or direct pressure with a pad over the bleeding point should be applied. As soon as possible, however, the source of hæmorrhage must be identified and treated directly by ligature. In the case of small vessels, torsion may suffice. For a large surface, the use of hot lotion (115°) checks oozing and facilitates the recognition of the chief sources of the hæmorrhage. Adrenalin chloride (1–1000 solution) mopped over a bleeding surface is useful in some cases.

Examination of the Wound.—The immediate and urgent indications for treatment having thus been met, careful examination of the wound is made to ascertain whether it is complicated by the division of important structures or the laying open of synovial or serous cavities. Of course, many of these questions can only be decided during the subsequent local treatment of the wound; but a preliminary examination as to the amount of blood that has been lost, and the position of the wound in relation to large arterial trunks, may guide the surgeon to examine carefully for a punctured or divided artery. Again, shock out of all proportion to the apparent severity of a wound of the abdominal wall will lead him to look for other signs of visceral injury. Distention of a joint may inform him that a comparatively trivial wound has penetrated and led to hæmorrhage into its synovial cavity. Loss of sensation and of muscular movement will call his attention to a nerve injury which might well escape attention at a subsequent operation with the patient anæsthetized. Again, if movements of the distal parts are studied, divided tendons will not pass unrecognized. This applies with special force to movements of the fingers in wounds of the hand and wrist.

Local Treatment of the Wound.—A thorough mechanical cleansing of the wound is essential in all cases. To the inefficient performance of this measure must be attributed most of the disastrous results which may follow accidentally-inflicted wounds. Where the wound is extensive, more particularly if there be much laceration, this cannot be satisfactorily carried out without an anæsthetic. The nature and magnitude of the operation will depend on the character of the wound. In an incised wound made by a clean instrument, comparatively little is necessary. In an extensively lacerated wound with much crushing and soiling with dirt, a formidable operation may lie before the surgeon, and must be carried out with meticulous care. In a deep punctured wound, such as may be made by a rusty spike, the surgeon must not hesitate to open the wound freely and thoroughly to explore and deal with its depths. This may, it is true, need an incision of considerable length; but it is precisely these wounds which lead to deep suppuration needing eventually multiple incisions. Apart from their danger to life, much crippling may result from matting together of tissues. The use of antiseptics is advisable. The wound is covered with a piece of gauze soaked in antiseptic lotion: carbolic (1–60 to 1–40) and biniodide of mercury (1–4000 to 1–2000) are frequently used. The surrounding skin is then thoroughly scrubbed with soap and water and shaved. The skin is next treated with antiseptic lotion: biniodide of mercury in spirit (1–1000) or picric acid in spirit (3 per cent) is best. The wound is now uncovered and its recesses are thoroughly exposed, the opening being enlarged if necessary. All foreign bodies, débris, and blood-clot are removed. Where laceration has been severe, badly-torn and devitalized tissues should be excised with the knife carefully and completely. Anaerobic infections being, however, very rare in civil practice, the extensive resection of soft tissue so necessary in the recent war is not called for. The surgeon should in most cases close the wound at once, and if he has carried out the cleansing procedure with care and thoroughness he will be rewarded by primary union in a large proportion of cases. If possible, apposition should be obtained by deeply-passed silkworm-gut sutures. Occasionally, in order to obliterate dead spaces, absorbable catgut sutures must, however, be buried. For healing to take place it is requisite that there shall be no gaps in the deeper part of the wound in which serum or clot may collect and form a breeding-ground for organisms. The wound is of course not germ-free; but healthy tissues brought into apposition will usually render organisms innocuous. If it be not possible to avoid a dead space in the depths of the wound, the insertion of a drainage tube for twenty-four hours is permissible. If, because of the condition of the patient, the nature of the wound, or other reason, the surgeon feels that his

cleansing operation has been insufficient, the wound may be left open and lightly packed with gauze soaked in such an antiseptic as eusol or flavine ; or Carrel's tubes may be introduced into all the recesses of the wound, which is then lightly packed with gauze and Dakin's solution instilled at frequent intervals. The technique of Carrel's treatment must be thoroughly mastered by the surgeon if good results are to be expected. What often passes for Carrel's treatment in this country bears little resemblance to that devised by its author. If the condition of the wound remains satisfactory and no septic infection follows, suture may be performed after three days (delayed primary suture). Should serious sepsis follow upon either primary or delayed primary suture, the wound needs to be laid freely open and treated by appropriate measures until all inflammation has subsided. As soon as a healthy granulating surface exists and local and constitutional signs of sepsis have disappeared, an attempt should be made to bring the wound together by secondary suture, the same care as before being given to the obliteration of dead spaces. If skilled bacteriological assistance is available, the decision as to whether a wound has reached 'secondary suture standard' may be helped by an estimation of the number of organisms present in smears taken from its surface.

In superficial lacerated wounds where there has been much soiling of the tissues with dirt, often the best method of treatment is to excise the wound *en bloc* by incisions passing everywhere through healthy tissue. The resulting wound may then be closed completely, with practical certainty of healing by first intention. This technique may with advantage be employed in many dirty scalp wounds.

When a granulating surface has resulted from failure of union or from the impossibility of bringing the edges together owing to loss of skin, healing may be hastened by skin-grafting. In some cases the gap may be closed by a plastic operation. As a dressing for a granulating surface, green protective, perforated with small holes, may be applied directly to the surface of the wound. Over this, plain sterile gauze is laid. Such a dressing needs daily changing, the wound being washed over with normal saline. Where granulations are becoming exuberant they should be touched with caustic, or lotio rubra applied.

Rest and Posture.—It cannot be too much insisted upon that, in order to secure the healing of wounds, rest must be provided. In extensive wounds of soft parts, splints or other methods of support are as important as in the case of fracture. Frequent inspection is necessary to see that a faulty position is not being assumed by the wounded part. Talipes equinus, flexion of the knee, and palmar flexion at the wrist are examples of vicious positions often tedious and difficult to remedy and yet often easily avoidable by correct posture during the treatment of a wound. Massage and movement must be started as soon as the condition of the wound permits.

After-dressings.—A wound which has been closed completely may, in the absence of signs of infection, be left undisturbed until the fifth to eighth day, when the stitches are ready to be removed. If a drainage tube has been left in, dressing will be necessary at the end of twenty-four hours, when, as a rule, the tube may be removed. The technique of dressing wounds is worthy of more attention than is usually given to it. Working single-handed, as very often must be the case, it is difficult to carry out an efficient ritual. If, however, the surgeon will accustom himself to doing dressings with two pairs of forceps, all aseptic requirements can be met and a great saving of time in washing and preparation effected.

Methods of Suture.—In trivial cuts without gaping, the edges may be approximated and collodion painted over them and the surrounding skin. A thin film of wool is then laid over the wound, and collodion again painted over this. After a few days, when this dressing separates, the wound will be found healed. In most wounds, however, sutures are necessary to approximate the skin edges. Silkworm gut is the best material. For wounds of the face the fine ophthalmic size may be used. The tension should be sufficient only to bring the skin edges in contact. Tight sutures predispose to infective processes about the stitch-holes. The skin edges must not be inverted : indeed, eversion should be aimed at rather than inversion. The ordinary methods of inserting the sutures are illustrated. They are : (1) *The interrupted suture : Fig.* 83. The sutures should be tied with a reef-knot in such manner that the knot lies away from the wound. (2) *The button-hole continuous suture : Fig.* 84. The first stitch is tied as in an interrupted suture. The needle is then passed in the same direction through the edges of the wound, and carried

over the loop left at A, and the suture drawn tight. The method of finishing off this stitch is shown in *Fig.* 85. The last passage of the needle is made in the reverse direction; but the suture is not pulled completely through. The double end B is then tied to the single end C. The completed stitch is shown in *Fig.* 86. (3) *The over-and-over continuous suture* is illustrated in *Fig.* 87. It gives less accurate apposition than the last method, and the scar at times is puckered. (4) *The subcuticular suture* is shown in *Fig.* 88. Since it avoids the scars of stitch-holes, this suture is useful in wounds of exposed parts. The needle is inserted a quarter of an inch from the end of the wound and in line with it. Emerging in the wound it is next passed through the deeper layers of the skin, first on one side of the wound and then on the other. Finally it is brought out a quarter of an inch beyond the far end of the wound. By pulling on the ends of the suture the edges are approximated. To remove, cut one end short and pull on the other.

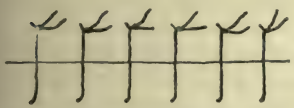


Fig. 83.—The interrupted suture.

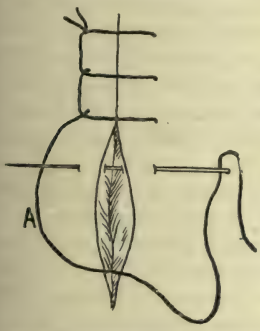


Fig. 84.—The buttonhole continuous suture.

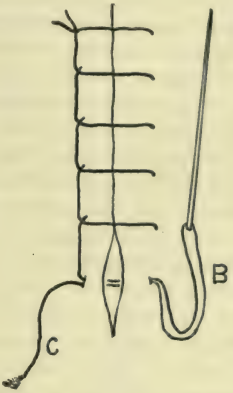


Fig. 85.—The buttonhole continuous suture: method of finishing off.

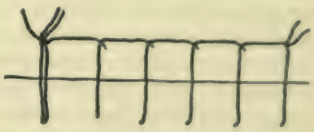


Fig. 86.—The buttonhole continuous suture completed.

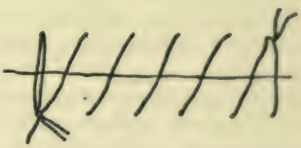


Fig. 87.—The over-and-over continuous suture.



Fig. 88.—The subcuticular suture.

General Treatment.—When a wound has been badly soiled, a prophylactic dose of antitetanic serum is advisable. Rest, and light and easily digestible diet, are ordered, and due attention to the evacuations must be paid throughout the course of treatment. Stimulants and tonics may be called for in different stages. *S. Maynard Smith.*

WOUNDS OF ARTERIES AND VEINS.—A wound in the blood-vessels may be complete or incomplete, subcutaneous or open, and involve arteries, veins, or capillaries.

If the division of an artery is complete and due to a sharp instrument, hæmorrhage is immediate and more or less serious, depending upon the size of the vessel injured and the freedom and rapidity with which blood escapes. The lesser vessels will spontaneously cease to bleed from contraction and retraction of their walls, clot formation, and the weakening power of the heart; the larger cause such sudden and serious hæmorrhage that life can only be saved by the promptest help.

If complete division of an artery is produced by a blunt force, the outer elastic coat is likely to be drawn out beyond the intima and media, and the largest may be at least temporarily closed by torsion of this.

If the wound in an artery is incomplete, it may become blocked up by extravasated

blood, and, if small, heal; if larger, a pulsating hæmatoma, traumatic aneurysm, arterio-venous aneurysm, or aneurysmal varix may form later. A traumatic aneurysm not infrequently follows subcutaneous injury.

The most frequent subcutaneous injuries occur in the visceral areas to the middle meningeal, mesenteric, splenic, and hepatic vessels. In the extremities they can occur as a complication of fracture and dislocation, and a diagnosis may be made by noting the presence or absence of pulsation in the vessels below the line of injury.

If a rapidly-enlarging hæmatoma forms after such an injury, an operation must be done and the bleeding vessels found and secured. In the skull, signs of compression, commencing a short time after injury, are the chief indications for operation; and, in the abdomen, signs of free fluid, and the well-known indications of hæmorrhage everywhere—viz., increasing pallor, especially to be noted in the lips, increasing rapidity and weakening of the pulse, anxiety and restlessness, sighing respiration, cold forehead, a clammy sweat, and inability to see clearly. In any case the proper treatment is to expose without delay the bleeding vessel in order to stop the escape of blood from it.

In the treatment of urgent open surgical hæmorrhage, the most important thing to remember is that *any bleeding point which can be reached by the finger is under its control.* A slight degree of finger pressure well applied will temporarily arrest any bleeding.

The next, scarcely of less importance, is that wounds which have not been fingered or probed rarely fail to heal without infection, but those into which fingers or probes have been introduced rarely escape it. The only excuse, then, for the introduction of a finger, is urgency, and when this has been met, the next indication is to disinfect the wound and its surroundings as soon as possible. For this purpose weak tincture of iodine painted around, and run into, the wound is a valuable aid. In the extremities, digital pressure on the main artery, or the use of a tourniquet, make interference with a wound before proper preparation unjustifiable.

An elevated posture, cold, heat, exposure to the air, the pressure of a pad, the actual cautery, and chemical agents, such as turpentine, perchloride of iron, suprarenal extract, and others, may suffice for the arrest of diffuse, but not profuse, hæmorrhagic oozing. Any serious hæmorrhage requires more direct and surgical measures.

The first rule should be to *see* the bleeding point. Free exposure and a good light are essential aids. The next is to ligature the divided vessels. These rules have few exceptions, which will be noted later.

Secondary Hæmorrhage.—A serious form of bleeding due to wound sepsis, and known as secondary hæmorrhage, less common than formerly, but still of too frequent occurrence, requires prompt and energetic treatment if the patient is not to be allowed to die as a result of it. Usually from the tenth to the twelfth day sudden arterial hæmorrhage occurs, without previous warning, from the septic wound. A suitably-placed pad and slight pressure easily arrests it for the time, but the tendency to recurrence is so great that reliance should not be placed upon this. The rule should be to open the wound freely without waiting for another hæmorrhage, to disinfect it as well as possible, to explore the bleeding points, and by one or other means secure the bleeding artery by ligatures in more healthy portions above and below, leaving the wound freely open and lightly packed with an antiseptic dressing. When all of this has been accomplished, it is still necessary to ensure constant skilled attendance for fourteen days afterwards, so that possible recurrence may be promptly dealt with.

Venous Hæmorrhage.—This is recognized by the darker colour of the blood and the continuous discharge of it, as compared with the bright colour of arterial blood and its escape in jets. It is more readily arrested by a pad and pressure, but, if profuse, requires the same treatment as arterial hæmorrhage, viz., exposure and ligature of the bleeding points.

Venous hæmorrhage at the root of the neck or in the axilla may be accompanied by entrance of air into the veins, and the sudden hiss that follows is so alarming that, when it has been heard, no time should be lost in finding and closing the opening. My own experience of it must have been singularly fortunate, because I have never seen the entrance of air do any harm. To find the opening, the wound is filled with a moist gauze mop, and, keeping steady pressure upon it, this should be gradually slipped off the distal part of the vein until the opening is exposed. To close this opening, if ligature presents

any difficulty, leave a pair of hæmostatic forceps on the hole in the vein and projecting from the wound for forty-eight hours, as this is a safe and successful measure.

Exceptions to the General Rules given.—When large and important vessels are wounded, occluding ligature of them is likely to be followed by serious consequences to the parts which they supply. It is now possible to close wounds in the blood-vessels and restore their lumen, to excise parts damaged beyond repair and remake the vessel by end-to-end anastomosis, or to fill up a gap by transplantation of portions of other vessels not so important. The principles of these operations are simple. They are asepsis, free exposure of the wounded vessels, complete control of the opening without damage to the vessel-walls, removal of all blood and clots from its lumen (irrigation with warm normal saline) without damage to the intima, and closure of the wound in the vessel-wall by a continuous fine silk suture through all the coats, everting the intima. Fine needles, gentle work, and sterile vaseline for the silk and needles are necessary for success, which in competent hands is now assured.

Bleeding from the Scalp is arrested with difficulty by Nature's means, because the great aids to arrest, retraction and contraction of its blood-vessels, cannot occur owing to the density of, and their adhesion to, the tissues of the scalp. For the same reason a ligature is difficult to apply. If pad-pressure fails to stop the bleeding, it can always be effected by the skilful use of needles and thread, which will act at the same time as ligatures and sutures.

Bleeding from the Palmar and Plantar Arches is usually an exception to the rule as to seeing the bleeding point. On account of the inelasticity of the parts, even a large incision may not permit of this, while an extensive incision is sure to inflict damage on the important structures underneath the palmar or plantar fascia. But the bleeding is likely to be serious, and is unlikely to stop until the bleeding point is effectually blocked. In the care of the hand, for example, the following steps should be taken :—

1. Apply a tourniquet to the upper arm.

2. Use every means to ensure the absence and prevention of sepsis by the use of cleansing, sterilization, and antiseptics.

3. Pack carefully, but thoroughly, into the bottom of the wound a small pad of sterile gauze, soaked in weak tincture of iodine. On this place a similar but somewhat larger pad, and on this a larger still, until a thick conical composite pad (graduated compress) projects upwards from the palm. Holding this in position, apply narrow rolls of lint along the course of the lower two-thirds of the radial and ulnar arteries, on the front of the forearm. (The course of the radial artery is indicated by a line drawn from the middle of the bend of the elbow to the base of the styloid process of the radius ; and of the lower two-thirds of the ulnar artery by a line drawn from the tip of the internal condyle of the humerus to the radial side of the pisiform bone.)

4. Apply a padded splint to the back of the forearm, reaching from the elbow to the tips of the fingers, and bandage it on carefully but firmly from below upwards, leaving the finger tips exposed.

5. With the patient in bed, elevate the limb to a position at as nearly a right angle as convenient, and remove the tourniquet. A suitable method of securing elevation is by the application of a long strap of adhesive plaster, folded over the end to form a loop, and fixed over the splint and bandages to the back and front of the forearm. The loop can then be fastened to a hook in the ceiling, or to the horizontal pole of a French bedstead or other available apparatus.

The after-treatment consists in letting the arm down in twenty hours ; and taking the splint and padding off the forearm in forty-eight hours, when the patient may be allowed to get up and use a sling. Unless there is pain, or rise in temperature, the dressing need not be disturbed for a week. It can then be soaked off in boracic lotion, and the wound dressed in an ordinary way.

Bleeding from the Tonsil.—This can be arrested by a finger pressed on the tonsil, assisted by outside counter-pressure applied just behind and below the angle of the jaw. The throat should then be examined in a good light, when some spouting vessel may be seen. If this can be secured by artery forceps, these may either be left on for some hours projecting from the mouth, or, if it seems feasible, a ligature may be passed under them on a needle and tied.

These measures failing, a long pair of padded forceps, one blade over the tonsil and the other resting on the neck, with the handles tied sufficiently firmly to compress the part, may be left on for a few hours.

Where these measures fail, it is necessary to tie the external carotid artery between its lingual and superior thyroid branches.

Bleeding from an Incised Tonsillar Abscess may be very serious, and is often difficult to stop. A small piece of disinfected sponge dipped in turpentine, packed into and left in the cavity, will occasionally arrest it when all ordinary means have failed.

Hæmatemesis and Melæna.—On one occasion I was asked to see a child two years of age, with hæmatemesis and melæna of one week's duration. It was nearly dead, had a waxy skin, was dropsical from anæmia, and fainted when its head was raised. There was no sign of anything wrong in its abdomen. On examination of the mouth, after depressing the tongue, I saw with the greatest ease and distinctness a little artery pumping at the bottom of a small crack far back on the dorsum of the tongue. With a thick knitting-needle and a cork a cautery was improvised which arrested the bleeding at once and permanently. The child slowly recovered.

Bleeding from the Nose that has resisted the ordinary remedies, such as keeping the arms raised above the head, pinching the nose, and breathing through the mouth, etc., may be so serious as to demand active measures. At times, with a good illumination, retractors, and sponging, it is possible to see a bleeding vessel on the septum; when this has been blocked, the bleeding ceases. More commonly, it is not possible to find the source of the bleeding, and pressure, by some form of dressing, is necessary. For many years, plugging the posterior nares was regarded as the only resort in serious cases; but the discomforts of it were such as to be apt to make the most heroic rebellious; and it was not without danger, for septic inflammation of the middle ear was not infrequent. By careful plugging through the anterior nares it is possible to arrest any ordinary hæmorrhage from the nose. Gauze (preferably iodoform-formalin-glycerin), cut in the form of a square of sufficient size, is pushed by forceps pressing on its centre, along the floor of the nose to the back of it. The edges of the gauze, at the nostril, are then opened up to display the projecting mouth of the pocket, and the pocket is steadily filled by strips of gauze: first, directly backwards, along the floor; next, upwards and backwards towards the floor of the orbit; and, finally, directly upwards. The hardness of this plug can be increased by pressure on the core and traction on the edges of the pocket. It is necessary, before leaving the patient, to be sure that blood is not escaping down the throat. Watch for the gulping efforts attending swallowing under such circumstances, and examine the back of the throat.

Bleeding after Tooth-extraction.—This is seldom serious except in hæmophilics. Styptics may first be tried, and the best of these is turpentine. To apply this, dry the socket as effectually as possible by pressing a sponge firmly over it, and continue the sponge pressure while a dossil of lint is being prepared and soaked in the styptic. Remove the sponge and quickly apply the lint, holding it in position till it becomes fixed by coagulated blood. If this fails, plug the socket from the bottom with a narrow strip of gauze, using a probe, and leave the projecting end to form a pad over the opening. Place a piece of cork over the pad, and fix the jaws together with a bandage sufficiently firmly to press on the cork. If the bleeding comes from an opening between two sound teeth, it can usually be arrested by fixing a piece of sponge firmly between them over the bleeding orifice. In the worst cases blood-transfusion from a suitable donor is necessary.

Bleeding from the Preputial Artery.—Serious bleeding from this source has occasionally followed forcible or awkward coitus. It can usually be arrested at once by the application of a small dossil of absorbent wool pressed over the bleeding point and retained in position by drawing the prepuce forward over it. If this fails, the torn artery should be snipped across with scissors, and if the bleeding does not cease after the retraction and contraction of it which this allows, it must be secured in forceps and tied in the ordinary way.

Bleeding from the Urethra.—This is usually the result of injury, and ceases spontaneously on the assumption of a horizontal posture. If not, the source of the hæmorrhage, penile or deep urethral, must be ascertained by pressure tests. For the penile portion, a catheter should be introduced to the root of the penis, which should be

firmly bandaged round it; for the deeper portion, after the catheter is in the bladder, a perineal pad and T-bandage supply the necessary pressure.

Bleeding from the Rectum.—If this is not arrested by rest in the horizontal posture and warmth to the surface, it is safest to administer an anæsthetic, to fix the patient in a good light in the lithotomy posture, and dilate the sphincter, when the bleeding point or surface can be seen and treated by ligature or cautery. If the arrest is not complete, a firm four-inch-long tube should be introduced and packed all round with iodoform gauze.

Bleeding from the Uterus.—Severe hæmorrhage is most frequently the result of a miscarriage, and demands emptying of the uterus for its arrest. The vagina should be packed with gauze wrung out of weak tincture of iodine. The patient should then be placed in the lithotomy position, and in a good light. The next step is to cleanse and shave the external genitals, and put on clean indiarubber gloves. The cervix is then exposed by a Sim's speculum and the source of bleeding discovered. (Bimanual pelvic examination will next be made when a cause for the hæmorrhage is likely to be discovered.) If the os is dilated or dilatable, a finger can then be swept round the interior of the uterus, and can remove its contents, if there are any, or be followed by packing with gauze wrung out of weak tincture of iodine if there is nothing to come away. By introducing an antiseptic sponge tent into the undilated cervix the most serious hæmorrhage can always be temporarily arrested.

Bleeding from an Intercostal Artery.—A stab or an operation for empyema may divide an intercostal artery. Bleeding from this can be arrested by a plug. A piece of gauze, four layers thick and one foot square, soaked in tincture of iodine, should be laid over the wound so that its centre corresponds to the opening in the chest. The gauze is then pushed into the chest for about an inch, and the pouch so formed is packed with a strip till it forms a ball inside. By pushing on the packing and pulling on the gauze, sufficient pressure is produced on the intercostal artery against the rib to stop bleeding from it.

Bleeding from a Divided or Broken Bone is best treated by cutting off a small piece of muscle and pressing it over the bleeding surface.

Bleeding from an Extremity.—If any vessel is seen spouting, secure it at once in forceps. If the wound is large and deep and bleeding, arrest hæmorrhage by pressing upon the main artery above and get a tourniquet. None is better than the ambulance man's substitute, viz., a strong handkerchief folded narrow, tied loosely round the limb, and tightened up by twisting with a walking-stick or poker introduced between the limb and the handkerchief. Pack the wound gently with gauze wrung out of weak tincture of iodine, and cleanse the skin all round with a swab wrung out of the same. With the wound in a good light, sponge blood and clots away, if necessary enlarging the wound to see to the bottom of it. The open mouths of divided vessels may now be seen, caught, and ligatured. If the bleeding has been from a good-sized vessel, the distal as well as the proximal end should be sought for and tied. If no open mouth is seen, having sponged the wound dry and clean, make pressure circularly on the limb from above downwards, when a drop of blood squeezed out may point to the orifice of a divided vessel.

If no result follows, untwist the tourniquet gently. If there is then no bleeding, apply a pad to the wound and bandage the limb, leaving the slack tourniquet in position, with directions how to use it if bleeding should recur.

If a large vessel has been wounded, bleeding from it will be evident when the tourniquet is loosened, and it is probable that only a hole has been made in it, otherwise its mouth would have been exposed by the previous proceedings.

It is now necessary to expose the vessel fully by dissection, and to treat the opening in it by suture, or to tie it above and below the opening with ligatures passed by the help of an aneurysm needle. A good substitute for this may be found in a director and probe. The director is passed under the vessel and the probe guided under it by the groove.

Rutherford Morison.

WRITER'S CRAMP.—(*See* CRAFT PALSIES.)

WRY NECK, SPASMODIC.—In this condition there is a clonic spasm of some of the muscles of the neck. The sternomastoid is more often affected than the trapezius. But other muscles may be involved: the splenius, the complexus, and the muscles of the suboccipital triangle.

Many of the patients are the subjects of nervous inheritance, and the condition in others supervenes on a severe shock. The cause is probably cortical, and the disease 'functional'.

Careful examination is necessary in order to discover the muscle at fault. Before the patient comes under the care of the surgeon, the usual antispasmodic remedies and nerve tonics will have been employed. Operation should not be considered until all other means have failed. Careful graduated exercises, aided by suggestion, will, if the medical man is able to gain his patient's confidence, succeed in many cases (*see* Tics). Operation, on the other hand, substitutes a paralysis for the clonic spasms of the affected muscles, and the spasmodic movements often reappear elsewhere.

If it is necessary finally to resort to operative measures, injection of alcohol deeply around the nerves supplying the affected muscles may be tried before employing more radical measures. Failing this, neurectomy must be performed. If the sternomastoid or sternomastoid and trapezius are alone affected, it is usual to remove a portion of the spinal accessory nerve. This may afford immediate relief, but the result is as a rule quite transient, as a consideration of the nerve-supply of these muscles would lead us to conclude.

The operation most generally necessary to paralyze the affected muscles is that devised by Gardner and by Keen independently—removal of a portion of the posterior primary divisions of the cervical nerves. This may be carried out by raising a triangular flap of skin, with its base in the mid-line extending from the occiput to the sixth cervical spine, and its apex at the mastoid process. The suboccipital triangle and semispinalis muscles are exposed by dividing the muscles covering them, and as much as possible of the nerves excised. (*See also* Tics, and for congenital wry-neck *see* Torticollis, Congenital.)

James Sherren.

X RAYS.—(*See* Radiotherapeutics.)

XEROSIS OF CONJUNCTIVA.—(*See* Conjunctiva, Diseases of.)

XEROSTOMIA.—(*See* Salivary Glands, Affections of.)

YAWS (Framboesia Tropica).—This disease is rarely met with in Europeans; when it does occur, it is usually in neglected children who have lived in close contact with natives. Cleanliness, good food, and careful attention to the evacuations greatly facilitate and expedite the cure.

The only specific treatment that appears to reduce the duration of the disease is salvarsan, but iodide of potassium, and mercury in full doses, have a decided effect in aborting the successive crops of the eruption, though they do not prevent their occurrence.

Beyond cleanliness, and protection from flies and irritation, no local treatment is required in most of the growths. When ulcerated, ordinary antiseptic dressing will suffice; but touching with blue stone or nitrate of silver is useful if there be any tendency for the ulcers to become chronic.

The painful yaws, 'crab yaws', on the soles of the feet are best treated by strong solution (20 per cent) of nitrate of silver dropped in, or the painful granulation at the base may be touched with nitric acid and so destroyed.

Salvarsan or, better still, novarsenobillon in 0·3-grm. doses, has a definite specific action, both in acute and chronic cases, and the results are permanent.

C. W. Daniels.

YELLOW FEVER.—The older plans of treatment were more active than those employed now, but venesection was abandoned long before the general reaction against it set in. Calomel and quinine, in large doses (20 gr. of the former and 22 gr. of the latter) were at one time largely employed. A brisk purgative (calomel or a saline) is now used at the commencement of the attack, but should not be repeated. Hot baths and sinapisms to the epigastrium check the vomiting and relieve cerebral congestion. The food should be fluid, well iced, and given in frequent small quantities, but the total amount of fluid given should be large. Some authorities give no food by the mouth during the first three

days, and supply fluid to some extent by rectal injections of normal saline. Such injections should always be given when there is much vomiting, and particularly if the albumin rapidly increases or the amount of urine passed diminishes.

A number of drugs have been used, many of them of an antiseptic nature. Carbolic acid, in doses of 1 to 2 min. every hour, has been much employed. Alkaline carbonates relieve the thirst, check the vomiting, and correct the burning acidity of the mouth so often complained of.

Sternberg's treatment is to give an ounce and a half of a mixture composed of 150 gr. sodium bicarbonate and $\frac{1}{3}$ gr. perchloride of mercury dissolved in a quart of water, every hour. It certainly checks vomiting, both in this disease and in blackwater fever, and recoveries under it have been numerous. As the causal agent of yellow fever circulates in the blood, this treatment is not likely to be a specific one.

Alcoholic stimulants should not be resorted to at the commencement, but will usually be required on or after the third day. Like all other fluids, they must be well iced, and given in small quantities at a time. Many, and in some epidemics nearly all, cases are very mild, and recovery after the third day is rapid and without dangerous symptoms.

Noguchi has recently announced the production of an efficient antiserum inimical to the *Leptospira icteroides*, so that one may anticipate with confidence its application in the near future to the treatment of yellow fever in man.

Whether the case is mild or severe, the patient must be protected night and day from the bites of the yellow-fever carrier, *Stegomyia calopus*, otherwise the disease may spread to other occupants of the house, or more widely. Destruction of the breeding-places of these mosquitoes and, by fumigation, of any mosquitoes in the house, also protection by suitable clothing, and proper use of mosquito nets, are the soundest methods of prophylaxis, whether the disease is endemic or epidemic. Noguchi's recent illuminating discovery of the *Leptospira icteroides* as the cause of yellow fever, his success in culturing the organism upon artificial media, and the degree of immunity he has produced by injection of cultures into guinea-pigs, justify the hope that, ere long, inoculation against yellow fever will constitute an invaluable prophylactic measure. *C. W. Daniels.*

SUPPLEMENTARY INDEX.

Heavy type denotes names of main articles.

PAGE

ABBOTT'S jackets in scoliosis 817
Abdomen, gunshot wounds of 414
– method of massage of .. 554
Abdominal aneurysms .. 52
– compress 476
– distention in pneumonia .. 687
ABDOMINAL INJURIES 5
ABORTION 5
– in eclampsia 272
Abrasions of cornea 315
ABSCESS 7
– alveolar 910
– – necrosis of jaw due to .. 507
– anal 8
– axillary 8
– of Bartholin's glands, gonorrhœal 400
– cerebral 149
– – dangers of exploratory puncture in 149
– of Cowper's glands, gonorrhœal 397
– dental 910
– drainage of 8
– hepatic 462
– ischiorectal 8
– mammary 551
– orbital (*see* Orbital Cellulitis) 660
– palmar and plantar .. 9
– peritonsillar 9
– peri-urethral, gonorrhœal .. 397
– pharyngeal 674
– residual, in acute appendicitis 76
– rest in treatment of .. 8
– of septum nasi 822
– submammary 551
– submaxillary 10
– subphrenic 886
Abscesses in amputation stumps 885
– Bier's hyperæmic treatment in 93
– Carrel treatment of .. 8
– phototherapy in 679
– specific therapy in 845, 848
– with spinal caries 856
– tuberculous, of bone, aspiration of 105
Accessory sinusitis (*see* Nose, Accessory Sinuses of)
Accouchement forcé in eclampsia 272
Acetanilide or antifebrin, poisoning by 691
Acetonæmia, vomiting with 972
Acetylsalicylic acid in cholecystitis 153
– – chorea 154, 157
Achilles tendon, inflammation of 914
– – rupture of 913
ACHYLIA 10
– typical prescriptions for .. 252
Acid dyspepsia 253
ACIDOSIS 10
– cyclical vomiting with .. 972

PAGE

ACNE 10
– high-frequency current in 290
– ionization in 280
– phototherapy in 679
– radiotherapy in 754
– scars from 813
– specific therapy in 847
Aconite, poisoning by .. 691
ACROMEGALY 11
Acromioclavicular joints, dislocations of 233
Acromion process, fracture of 357
ACROPARÆSTHESIA 11
ACTINOMYCOSIS 11
– necrosis of jaw due to .. 508
– of salivary glands 804
Adams' varus splint 906
Addisonian anæmia (*see* Anæmia)
ADDISON'S DISEASE 12
Adenitis, tuberculous (*see* Tuberculous Glands)
– – *x* rays in 756
ADENOIDS 13
– breathing exercises for .. 17
– in causation of enuresis .. 300
– diagnosis and symptoms .. 13
– with middle-ear disease 261, 263, 266
– operation for, after-treatment 17
– – anæsthesia in 15
– – with curette 17
– – with forceps 16
– – preparation of patient .. 15
Adenoma of palate 510
– prostate 706
– thyroid 389
Adhesions between septum nasi and turbinates .. 822
– due to scar tissue 813
– effect of chlorine ions on .. 280
Adrenalin in asthma .. 79
– beri-beri 90
– shock 825
Agoraphobia (*see* Neurasthenia; Psychotherapy)
Agraphia 67
Air baths 89
– heated, Bier's hyperæmic treatment by means of 93
– passages, foreign bodies in (*see* Foreign Bodies)
– swallowing (*see also* Flatulence) 332
Aix douche 472
ALÆ NASI, COLLAPSE OF .. 18
Albuminous or serous periostitis and osteomyelitis 100, 103
ALBUMINURIA, CYCLICAL .. 18
– in pregnancy (*see* Eclampsia)
Alcohol and acute laryngitis 530
– in cancer 137
– cirrhosis of liver .. 157, 158
– gout 409
– headache due to 439
– injections of nerves in cerebral palsies of childhood 664

PAGE

Alcohol injections in spasmodic wry-neck 999
– – trigeminal neuralgia 629, 631
– in insomnia 496
– – in chronic bronchitis .. 124
– mental disease 572
– neuritis due to 636
– in pneumonia 688
– poisoning by 691
– in pulmonary congestion and œdema 176
Alcoholic coma 19
Alcoholics, erysipelas in .. 313
ALCOHOLISM 19
– acute 19
– – œsophagitis due to .. 655
– chronic, hypnotism in .. 481
Alexia 67
Alkalinity of urine as cause of enuresis 301
Allen and Joslin's diet scheme for diabetes mellitus .. 211
Alopecia 22, 429
ALOPECIA AREATA 22
Alveolar abscess 910
– – necrosis of jaw due to .. 507
Alveolus, fracture of .. 505
Amaurosis in tabes 899
Amblyopia with squint .. 871
Ambrine treatment of burns 128
AMENORRHŒA 22
– static electricity in .. 292
Ammonia, poisoning by (*see* Caustic Potash and Soda) 692
Amnesia, verbal 67
Amœbic diarrhœa 226
– dysentery (*see* Dysentery)
Amputation in acute bone inflammations 102
– gangrene 373
– stumps 883
Amyl nitrite in infantile convulsions 191
Amylene hydrate in mental disease 578
Amœid dyspepsia (*see* Achylia)
ANÆMIA (*see also* Chlorosis) 23
– blood transfusion in .. 937
– pernicious (*see* Pernicious Anæmia)
– in pulmonary tuberculosis 743
– septic 23, 28
– spa treatment of 446
– splenic 860
ANÆMIA, TROPICAL 33
– types of 23
Anæmic ulcers 950
Anæsthesia, bronchitis after 41
– colour of patient in .. 39
– corneal reflex in 39
– danger in 40
– in diabetes 217
– hysterical, faradization in 287
– infiltration 43
– methods to prevent shock 825
– in mouth operations .. 38
– pulse in 39
– recovery from 41

PAGE

Anæsthesia, relaxation of the muscles in 40
– respiration in 38
– resuscitation methods in .. 40
– shock after 41
– size of pupil in 40
– thirst after 41
– in thyroid operations .. 393
– for tonsillectomy .. 933, 934
– in tracheobronchoscopy and œsophagoscopy 341
– vomiting after 41
ANÆSTHETICS, ADMINISTRATION OF 34
– – A.C.E. and other mixtures 38
– – the anæsthetic state .. 38
– – chloroform 37
– – choice of anæsthetic .. 42
– – ether 36
– – – intravenous 37
– – – rectal 37
– – ethyl chloride 35
– – local anæsthesia or analgesia 43
– – nitrous oxide 35
– – recovery from anæsthesia 41
– preparation and examination of patient 34
– relative safety of various .. 42
Anal abscess 8
– fissure 65
– fistula 66
– papillomata (warts) .. 65
Anaphylaxis 837
Anasarca, generalized, Southey's tubes and paracentesis in 242
Anastomosis of nerves 618, 622
Aneurysm, abdominal .. 52
– arteriovenous 49
– – of carotid and jugular vessels 52
– – subclavian vessels .. 52
– axillary 49
– brachial 50
– coagulating fluids injected into sac 45
– of common carotid artery 51
– of external and internal carotid arteries 51
– gluteal 50
– of iliac arteries 52
– inguinal 52
– of innominate artery .. 51
– leg and foot 51
– lower extremity 50
– neck 51
– palmar vessels 50
– popliteal 50
– of renal artery 52
– subclavian artery 51
ANEURYSM, SURGICAL TREATMENT OF 44
ANEURYSM, THORACIC .. 52
– – diet in 53
– – drugs in 53
– – electrolysis in 54
– – galvanopuncture in .. 54
– – injection of gelatin in .. 55
– – introduction of foreign bodies into sac in .. 54
– – narcotics in 55
– – operative measures in .. 54
– – potassium iodide in .. 53
– – rest in 53
– – treatment by internal irritation of the walls 54
– treatment by ergotine injections 45
– – excision of the sac .. 48
– – flexion of limb 47
– – foreign bodies introduced into sac 45

PAGE

Aneurysm, treatment by galvanopuncture .. 45
– – ligature of artery of supply 48
– – manipulation 45
– – Matas' operation .. 48
– – needling of sac .. 45
– – operation 48
– – pressure 45
– – – objections to 47
– – Reid's method 46
– – suture of the aneurysmal openings 48
– of upper extremity .. 49
– vertebral artery 52
– visceral branches of aorta 52
Aneurysmal varix 49
ANGEIOMATA 56
– carbon dioxide snow in 57, 140
– diathermy in 291
– electrolysis in .. 56, 283
– excision of 56
– of jaw 509
– radium in 764
– of tongue 930
– *x* rays in 755
Angeioneurotic œdema (*see* Urticaria)
ANGINA LUDOVICI 57
ANGINA PECTORIS 58
– – treatment in inter-paroxysmal periods .. 59
– – – of paroxysms 58
– Vincent's 969
Anginal pain in valvular disease 453
Angular conjunctivitis .. 180
Aniline, poisoning by .. 691
Ankle, bony ankylosis of .. 63
– dislocations of 238
– fractures of bones of .. 369
– sprained, strapping for .. 867
– tuberculous disease of .. 516
ANKYLOSIS OF JOINTS .. 60
– – bony 63
– – congenital 60
– – fibrous 62
– – following sprains .. 62
– – peripheral bony 60
– – prevention of 61
– – in rheumatoid arthritis, surgery in 788
Ankylostomiasis 34
Anodynes for headache 440, 441
ANOREXIA NERVOSA .. 63
ANOSMIA 64
Anteflexion and anteversion of uterus 963
Ante-partum hæmorrhage .. 421
ANTHRAX 64
– specific therapy in .. 847
Antibodies and toxins .. 833
Antimony, poisoning by .. 691
Antiphlogistine, method of applying 919
Antipyretic, effect of drip sheet as 474
Antipyretics in pulmonary tuberculosis 742
Antipyrin (phenazone), poisoning by 694
Antisepsis in syringing of ear 256
Antiseptic treatment of pernicious anæmia 31
Antiseptics in wounds of soft parts 983
Antistreptococcic serum treatment of pernicious anæmia 32
Antitetanic serum in gunshot wounds 412
Antitoxin, diphtheritic, method of giving 226

PAGE

Antitoxin, diphtheritic, test of immunity with .. 232
– rash in treatment of diphtheria 227
– sera, preparation and standardization of 834
– treatment of tetanus .. 917
Antivenin in snake-bite poisoning 829
Antrum, fracture of 506
– suppuration in .. 641, 642
– tumours of 511
Anuria (*see* Urine, Retention of, 959; Urine, Suppression of, 961)
– calculous 134
Anus, abscess of 8
– epithelioma of 65
– fissure of 65
– pruritus of 710
ANUS, SURGICAL DISEASES OF 65
Aorta, aneurysm of visceral branches of 52
Aortic valvular disease (*see* Heart, Valvular Disease of)
Aortitis, thoracic 88
Aperients in habitual constipation 186, 188
– iron combinations in treatment of chlorosis .. 25
APHASIA 66
Aphonia, hysterical, faradization in 287
APOPLEXY (*see also* Hemiplegia) 67
– from cerebral hæmorrhage 68
– – – arrest of hæmorrhage 68
– – – arterial depletion unwise 69
– – – direct compression of carotid artery in .. 70
– – – diuretics of little value in 72
– – – lumbar puncture in .. 71
– – – nitrites in 69
– – – purgation in 71
– – – relief of pressure symptoms in 70
– – – treatment of asphyxia in 71
– – – uselessness of hæmostatic drugs in .. 70
– – – venesection in .. 71
– – – venous depletion in .. 71
– from occlusion of cerebral vessels 72
– – – – after-treatment of thrombosis .. 73
– – – – prevention of spread of coagulation .. 72
– – – – purgatives in .. 72
– – – – stimulants in .. 72
– – – – thrombosis due to syphilis 73
– – – – treatment of coma 73
– – – – embolism .. 74
APPENDICITIS 74
– acute 74
– – cases with localized abscess 75
– – – seen when disease has spread outside appendix 75
– – – – within 24 to 36 hours 74
– – complications 76
– chronic 76
– – with dyspepsia 77
– – with irregular attacks of pain 77
– post-operative suppuration, vaccine therapy in .. 850
– rheumatic 778
– thrombophlebitis due to .. 677
Appendicostomy for chronic constipation 190

PAGE

Appendicostomy for colitis 167, 168
– in congenital dilatation and hypertrophy of the colon 170
Aphthous stomatitis (*see also* Thrush) 882
Apraxia in hemiplegia .. 461
Arenaria for giving sun-baths 456
Arm, amputation stumps .. 884
Arrhythmia (*see also* Heart, Irregularity of) 447
– due to auricular fibrillation 109, 448
– – extrasystoles .. 108, 447
– sinus 449
Arsenic in chlorosis 27
– chorea 155
– lymphadenoma 548
– necrosis of jaw due to .. 508
– neuritis due to 636
– in pernicious anæmia .. 30
– poisoning by 691
– in valvular heart disease 449, 454
Arterial depletion in apoplexy, unwisdom of 69
– disease, heart disease with 599
– – spa treatment in .. 444
Arteries and veins, wounds of 985
Arteriosclerosis (*see* Atherosclerosis; Hyperpiesia)
Arteriovenous aneurysm .. 49
– – of carotid and jugular vessels 52
– – subclavian vessels .. 52
Arthritis, acute, of infants .. 100
– deformans (*see* Rheumatoid Arthritis)
– – radium treatment .. 766
– galvanism in 281
– gonococcal, diathermy in 290
– – Bier's hyperæmic treatment in 92
– – vaccine therapy in .. 849
– pneumococcal, specific therapy in 689
– rheumatic (*see* Rheumatism)
ARTHRITIS, SUPPURATIVE .. 77
– – Bier's hyperæmic treatment in .. 78, 92
– – Carrel treatment .. 77
Articular rheumatism .. 771
Artificial membrane in otitis media 264
– respiration, Schäfer's method 242
Ascites in cirrhosis of liver .. 158
– Talma's operation in .. 158
Aspergillus of external ear .. 255
Asphyxia (*see also* Drowned, Treatment of the Apparently; Laryngeal Obstruction; Poisoning)
– in apoplexy 71
Aspiration in empyema .. 293
– of tuberculous abscesses of bone 105
– (*see also* Paracentesis)
Association, disordered, in hemiplegia 461
ASTHENOPIA 78
ASTHMA, BRONCHIAL .. 78
– – general and climatic treatment 80
– – prescriptions suitable for 81
– – removal of cause .. 80
– – treatment of the spasm 78
– – – the underlying tendency 79
– spa treatment in 444
Astigmatic correction in squint 871
Astragalus, dislocations of .. 238
Ataxy in hemiplegia.. .. 461
Atheroma (*see* Atherosclerosis; Aortitis; Hyperpiesia)

PAGE

ATHEROSCLEROSIS (*see also* Hyperpiesia) 81
– decrescent 87
– hyperpietic 82
– toxic 86
ATMOSPHERIC TREATMENT .. 88
Atonic constipation 185, 188, 189
– dyspepsia, massage for .. 554
Atony of sphincter causing enuresis 302
Atoxyl treatment of trypanosomiasis 943
Atresia of external auditory meatus 255
Atrophic laryngitis 532
– rhinitis 794
Atrophy, progressive muscular, massage in 555
Atropine, method of use in iritis 503
– poisoning by 692
– substitutes for 503
Auditory aphasia 67
Auricle, diseases of (*see* Ear)
Auricular fibrillation 109, 448
– – and flutter, tachycardia due to 900
Auto-intoxication in chronic constipation 189
Axillary abscess 8
– aneurysm 49

BACILLURIA causing enuresis 301
Bacillus coli cystitis .. 203
– – infection, iritis due to .. 502
– – – vaccine therapy in .. 850
– of malignant œdema .. 375
Bactericidal sera, preparation and standardization of 835
Bacteriology of puerperal sepsis 721
Bacteriotherapeutics (*see* Specific Therapy)
BALANITIS 89
Baldness 22, 429
Ball's operation in pruritus ani 711
Balneological and climatic treatment of chlorosis 24, 28
Banting's dietary for obesity 653
Banti's disease (*see* Splenic Anæmia)
Barbitone (veronal) in insomnia 496
– mental disease 578
– poisoning by 692
Barium salts, poisoning by.. 692
Basham's mixture 608
Bassini's operation in inguinal hernia 463
Bathing of eye—method .. 503
Baths (*see also* Hydrotherapy) 470
– in acute bronchitis .. 119
– – nephritis 604
– air 89
– Berthollet 920
– Brand 471
– brine 473
– – for sprains 868
– Bull's 326
– in cerebral rheumatism .. 777
– cold 472
– contrast and whirlpool .. 472
– double electric, for lead-workers 685
– douche 472
– electric 288, 920
– – in gout 403
– in fevers 326

PAGE

Baths, graduated (Ziemssen) 471, 472
– Harrogate hot-air .. 922
– hot, full and local .. 479
– – mustard, for bronchopneumonia in children 126
– hot-air douche 922
– – in gout 403
– in mental disease 579
– mineral water 472
– Nauheim 472
– neutral and tepid 471
– peat or 'moor' 473
– pruritus due to 709
– radiant-heat 921
– in rheumatoid arthritis .. 787
– Russian 920
– saline 473
– in small-pox 828
– sulphur 473
– – in gouty eczema .. 404
– sun (*see* Heliotherapy)
– in sunstroke 886
– Turkish 920
– – dangers in gout 404
– Tyrnauer's hot-air apparatus 921
– vapour 920
– whirlpool, etc., for sprains 869
Battle's vermin killer, poisoning by 692
Bed-sores in fevers 328
– paraplegia 669
– with spinal fractures .. 859
Bee-stings in rheumatism .. 776
Bell, nerve of, injuries of .. 624
Bell's palsy (*see* Facial Paralysis)
Belladonna, poisoning by (*see* Atropine) 692
– treatment of constipation in children 185
– – enuresis 302
Bennett's fracture 363
Benzol, poisoning by .. 692
– treatment of leukæmia .. 538
Béraneck's tuberculin .. 736
Bergonié's faradization method in obesity .. 288, 654
BERI-BERI 90
Bernhardt's disease (*see* Nerves, Peripheral)
Beverages in acute diarrhœa 217
– for diabetics 216
– in diarrhœa, acute .. 217
BIER'S HYPERÆMIC TREATMENT 90
– – – in abscesses 93
– – – aims of 91
– – – in bone inflammations 102, 103
– – – carbuncles and boils 93, 143
– – – chilblains 92
– – – by cupping-glasses .. 93
– – – elastic constriction .. 91
– – – in epididymitis .. 92
– – – gonorrhœa 395
– – – gonorrhœal arthritis .. 92
– – – by heated air .. 93
– – – in inflammation of tendons 915
– – – keloid 518
– – – lupus 93
– – – mastitis 93
– – – methods of application 91
– – – in neuralgia and sciatica .. 94, 95
– – – osteitis 95
– – – osteomyelitis 92
– – – otitis media suppurativa 93
– – – parotitis 804
– – – post operative keloid cicatrices 93

PAGE

Bier's hyperæmic treatment in Raynaud's disease 374
– – – rheumatoid arthritis .. 788
– – – scars 812, 814
– – – septic conditions of the head and neck .. 92
– – – – injuries with lymphangitis and cellulitis 92
– – – sprains .. 866, 869
– – – suppurative arthritis 78, 92
– – – tenosynovitis 92
– – – tuberculous joints 92, 514
– – – – osteitis .. 104–6
– – – whitlows 92
BILE-DUCTS, CATARRH OF (*see also* Cholecystitis, 152; Gall-stones, 370) .. 95
– – acute and chronic .. 95
– – infective and suppurative 96
BILHARZIASIS 96
BILIARY FISTULA 96
Bilious attacks (*see* Gastritis, 378; Headache, 438; Migraine, 583; Vomiting in Childhood, 970; Vomiting, Cyclical, 972; etc.)
B.I.P.P. in tuberculous joints 515
BIRTH PALSY 97
– – massage in 554
BLACKWATER FEVER 98
– – cardiac failure in .. 98
– – hyperpyrexia in .. 99
– – relapsing forms 99
– – suppression of urine in 98
Bladder calculus (*see* Calculus, Vesical)
– gunshot wounds of .. 414
– hæmorrhage from .. 415–17
– infection, pyelonephritis following 745
– inflammation of (*see* Cystitis)
– irritability causing enuresis 301
– over-distended, dangers of rapid emptying .. 960
– papillomata of, diathermy in 291
– troubles in tabes 898
Blanket tent in gout .. 403
Bleeding (*see* Venesection)
Blepharitis, ciliary, specific therapy in 848
– squamosa 320
– ulcerosa 321
Blepharospasm in corneal ulceration, to overcome 192
– phlyctenular disease .. 195
Blind eye with staphylomatous cornea 194
Blindness from optic atrophy in tabes 899
– word 67
Blood-poisoning (*see* Septicæmia)
– pressure, high, diathermy in 290
– – – headache due to 438, 441
– – – in valvular disease .. 453
– – relation to eclampsia .. 269
– transfusion (*see* Transfusion) 936
– – in pernicious anæmia .. 33
– vessels, changes with granular kidney 613
– – gunshot wounds of .. 413
– – wounds of (*see* Wounds of Arteries and Veins)
BOILS 99
– Bier's hyperæmic treatment in 93, 143
– in diabetes 217
– ear 258
– Gallois treatment of .. 99
– phototherapy in 679

PAGE

Boils, specific therapy in .. 847
– vaccine treatment of .. 100
Bomb wounds (*see* Gunshot Wounds)
Bone, bleeding from .. 989
– grafting in spinal caries .. 855
– gunshot wounds of .. 413
BONE, INFLAMMATIONS OF .. 100
– – acute infective osteomyelitis of cranial bones 103
– – – – periostitis and osteomyelitis 100
– – – – – – removal of sequestrum .. 101
– – Bier's hyperæmic treatment 102, 103
– – chronic osteomyelitis and periostitis 103
– – the question of amputation 102
– – treatment of bone sinuses 102, 103
– – vaccines in 101, 103, 848
– marrow in pernicious anæmia 31
– pain in amputation stump 885
– sinuses, treatment of 102, 103
– – in tuberculous osteitis .. 105
– – s urs in amputation stumps 885
BONE, TUBERCULOUS DISEASE OF 103
– – – aspiration of abscesses 105
– – – diet in .. 104, 106
– – – Bier's hyperæmic treatment 104–6
– – – open-air treatment .. 104
– – – sinuses in 105
– – – tuberculin treatment 104, 851
BONE, TUMOURS OF 106
– – chondromata 106
– – cysts 107
– – endotheliomata 107
– – myelomata 106
– – osteomata 106
– – sarcomata 107
– – – Coley's fluid in .. 108
– – – radium in 108
Bony ankylosis 63
– growths of external auditory meatus 257
BORBORYGMI 108
Bougies, method of passing in urethral stricture .. 954
Brachial aneurysm 50
– neuralgia 629
– plexus, injuries of 624
BRADYCARDIA 108
BRAIN, COMPRESSION OF .. 109
BRAIN, CONCUSSION OF .. 110
– decompression operation for tumour 500
BRAIN, LACERATION OF .. 111
Brand bath for enteric .. 471
– – in fevers 327
Bread substitutes for diabetes 210
Breast cancer, radium treatment 762
– feeding 489
– hydatid cysts of 113
BREAST, HYPERTROPHY OF .. 111
– inflammation of (*see* Mammary Abscess, 551; Mastitis, 555)
– multiple cystic disease .. 113
BREAST, NEURALGIA OF .. 111
BREAST TUMOURS .. 112
– – cysts 112
– – of doubtful character .. 117
– – fibro-adenomata .. 112
– – galactoceles 113
– – malignant 113
– – – age in relation to the question of operation 114

PAGE

Breast tumours, malignant, atrophic schirrus .. 114
– – – bilateral 115
– – – cirrhosis complicating 114
– – – diabetes complicating 114
– – – indications for operation 114
– – – lymphatic œdema of the arm 117
– – – medical treatment of inoperable 116
– – – non-operative treatment 116
– – – oöphorectomy in .. 116
– – – palliative operations 115
– – – post-operative treatment 115
– – – pregnancy complicating 115
– – – radical operations for 113
– – – renal disease complicating 114
– – – treatment of recurrent disease 116
BREATH, OFFENSIVE 117
Breathing exercises for adenoids 17
– – for stammerers 873
Bright's disease (*see* Nephritis, Acute, 602; Chronic, 606)
Brine baths 473
– – for sprains 868
Bromide poisoning in treatment of drug habit .. 243
Bromides for insomnia in chronic bronchitis .. 124
– in mental disease 579
Bromidrosis (*see* Perspiration, Offensive)
Bromine treatment of epilepsy 307
Bronchi, foreign bodies in (*see* Foreign Bodies in Air-passages)
Bronchial asthma (*see* Asthma, Bronchial)
BRONCHIECTASIS 118
BRONCHITIS, ACUTE 119
– – baths in 119
– – diet in 119
– – drugs in 119
– – importance of sleep in 120
– after anæsthesia 4
– cardiac failure in .. 121, 12
BRONCHITIS, CHRONIC .. 12
– – drug treatment 12
– – general and preventive treatment 12
– – insomnia in 12
– – specific treatment .. 12
– – treatment of cough .. 12
– opium in .. 120, 121, 12
– relation to gout 44
– spa treatment in 44
– specific therapy in .. 84
BRONCHOPNEUMONIA, CATARRHAL 12
– – after-treatment 12
– – hot mustard baths in .. 12
– chest compress for .. 47
Bronchoscopy (*see* Foreign Bodies in the Air-passages)
Brooke's ointment for lupus 54
Brophy's operation for cleft palate 1
Bruises of bursæ 1
Brunings' endoscopic apparatus 3
Bubo, chancroidal 1
Bull's bath in fevers .. 3
Bullet wounds (*see* Gunshot Wounds)
BUNION 4
Buphthalmos 3

PAGE

Burnett's disinfecting fluid, poisoning by (*see* Hydrocyanic acid; Zinc) 691, 695
BURNS AND SCALDS 126
– – of eye 129, 182
– – general treatment .. 126
– – local treatment 127
– – mouth and throat .. 129
– – œsophagitis caused by hot drinks 655
– – paraffin or ambrine treatment 128
– – prevention and treatment of hypertrophic scarring and deformity 129
– – regional 129
– – skin grafting in .. 129
– – treatment of shock .. 126
– – – third and fourth degree burns when granulating 128
– – – – – – – up to separation of eschar 128
BURSÆ, AFFECTIONS OF .. 129
– bruises of 130
– inflammation of 130
– in neighbourhood of shoulder, hip, knee, and heel, affections of 131
– penetrating wounds of .. 130
– special, affections of .. 131
Bursitis, syphilitic 131
– traumatic chronic .. 130
– tuberculous 130

CÆCOSTOMY, indications in obstruction 499
Cæsarean section in antepartum hæmorrhage .. 423
– – eclampsia 272
CAISSON DISEASE 131
Calabar bean, poisoning by .. 692
Calcium salts for chilblains .. 151
Calculus anuria 134
CALCULUS (*see also* Uric Acid Gravel, 958) .. 132
– pancreatic 664
– renal 134
– – operative treatment .. 135
– – spa treatment 135
– salivary 805
– ureteric 133
– – hydronephrosis due to 469
– vesical 132
– – litholapaxy for 132
– – lithotomy for 132
Callosities 197
Calories, table of, for diabetic diet 212
Camphor, poisoning by .. 692
Canaliculus, obstruction of, epiphora due to .. 525
– slitting the 526
CANCER 136
– alcohol in 137
– of anus 65
– auricle 254
– breast (*see* Breast Tumours, Malignant)
– cleanliness in treatment of 137
CANCER OF COLON 143
– diathermy in 291
– diet in 137
– effect of mental and moral atmosphere in 138
– of external auditory meatus 255, 257
– general treatment of .. 136
– hydronephrosis due to .. 469
– intestinal obstruction due to 499
– of jaw 509

PAGE

Cancer of larynx 532
– lip 590
– menorrhagia and metrorrhagia symptoms of .. 562
– of middle ear 258
– mouth and pharynx .. 585
– nose 651
– œsophagus 657
– pancreas 664
– parotid gland 808
– prostate 705
– radium treatment .. 760
– of rectum 768
– – radium in 769
– relation of gall-stones to 371
– relief of pain in 138
– rest in treatment of .. 136
– of stomach 880
– sunshine in treatment of 138
– of thyroid 389
– tongue and mouth .. 590
– – pre-cancerous conditions 928
– tonsil 591
– treatment of constipation 137
– – hæmorrhage 138
– *x* rays in 756
Cancrum oris 883
Canine fossa, fracture of .. 505
Canities 430
Cannabis indica, poisoning by 692
Cantharides, poisoning by .. 692
Carbohydrate treatment of delayed chloroform poisoning 152
Carbohydrates, tables of, for diabetes 208
Carbolic acid injections in internal piles .. 427
– – poisoning by 691
Carbolized vaccine in rabies 749
Carbonaceous foods, effect on headaches 438
Carbonic acid, poisoning by 692
CARBONIC ACID SNOW .. 139
– – – for angeiomata .. 57
– – – chronic eczema .. 141
– – – effects of application 140
– – – indications for use .. 140
– – – for internal hæmorrhoids 142
– – – lupus vulgaris and erythematosus .. 141
– – – mode of application 140
– – – for moles 141
– – – nævi 140
– – – rodent ulcer 141
– – – technique of preparation 139
– – – for trachoma 142
– – – urethral caruncle .. 142
– – – warts and corns .. 141
Carbonic oxide, poisoning by 692
CARBUNCLES 142
– Bier's hyperæmic treatment in 93
– in diabetes 217
– specific therapy in 847
Carcinoma (*see* Cancer)
Cardiac disease (*see* Heart)
Caries of external auditory meatus 256
– ossicles 264
– spine (*see* Spine)
– – paraplegia with .. 60
– teeth (*see* Teeth)
Carotid artery, common, aneurysm of 51
– – external and internal, aneurysm of 51
– and jugular vessels, arteriovenous aneurysm of .. 52

PAGE

Carpal bones, fractures of .. 362
Carrel-Dakin treatment of abscesses 8
– – shell wounds 812
– – suppurative arthritis .. 77
– – in wounds of soft parts 984
Carriers, diphtheritic, vaccination in 232
– of cerebrospinal meningitis, freeing of 560
Cartilage grafting after frontal-sinus operation .. 644
– – for 'saddle-backed' nose 649
Cartilages of knee torn or displaced 520
Cartilage-trusses for knee .. 520
Caruncle, urethral 953
– – carbonic acid snow for .. 142
Cataphoresis (*see* Electrotherapy, Ionization)
CATARACT 144
– complete congenital .. 144
– double 147
– extraction 148
– – complications after .. 148
– – dressing after 148
– – iritis after 148
– – management of case after 147
– – suppuration after .. 148
– glaucoma associated with 384
– immature 146
– iridectomy in .. 145, 146
– iridocyclitis and 145, 146, 148
– lamellar 144
– monocular 145, 147
– mucocele of lachrymal sac complicating 147
– needling for .. 145, 148
– senile and complicated .. 146
– traumatic 145
Catarrh of bile-ducts (*see* Bile-ducts)
– chronic, of intestine 218, 219
– gastric, vomiting in childhood due to 970
– of middle ear 259
– nasal (*see* Rhinitis)
– – œsophageal 655
– post-nasal, in children, vomiting due to .. 972
– of stomach, chronic .. 378
Catarrhal colitis, acute .. 165
– diarrhœa of infants (*see* Diarrhœa)
– laryngitis (croup) 199
– – chronic 531
– pharyngitis 673
– proctitis 704
– stomatitis 882
Catheter fever 937
Catheterization in enlarged prostate 706
– Eustachian—method .. 260
– – method of, in retention .. 939
– – rupture of urethra .. 952
Caustic potash and soda, poisoning by 692
Causties, burns of conjunctiva due to 182
– in rabies 747
Cauterization in catarrhal conjunctivitis 179
– of infiltrated or spreading corneal ulcers 192
– in lupus vulgaris 545
– of turbinates in hay fever 435
– – in rhinitis 791
Cautery, clamp and, treatment of internal piles .. 429
Cellulitis (*see also* Erysipelas)
– Bier's hyperæmia in .. 92

PAGE

Cellulitis, orbital 660
– with scarlet fever 810
– specific therapy in .. 845
Cerebellar symptoms, seton treatment 823
CEREBRAL ABSCESS 149
– – dangers of exploratory puncture in 149
– galvanism 282
– hæmorrhage (*see* Apoplexy; Hemiplegia)
– – at birth, convulsions due to 190
CEREBRAL IRRITATION 111, 150
– palsies of childhood .. 663
– rheumatism 777
– symptoms, seton treatment 823
– syphilis (*see* Syphilis of the Nervous System)
Cerebrospinal meningitis (*see* Meningitis)
Certification of mental cases, hints on 579
Cervical cellulitis with scarlet fever 810
– rib, nerve symptoms due to 624
– sympathetic nerve, injuries of 628
Cervicitis, gonococcus vaccine in 849
Cervix uteri, bleeding from erosions 562
– – chronic infection of, ionization in 280
– – dilatation of, in dysmenorrhœa 249
– – mucous polypus of .. 562
Cesspool gas poisoning (*see* Sewer Gas) 692
Chalazion 319
– specific therapy in .. 847
CHANCROID 150
– complicated by phimosis 150
Chancroidal bubo 150
Chest, compress for 476
– gunshot wounds of .. 414
Cheyne-Stokes respiration .. 594
CHICKEN-POX 151
– scars from 813
CHILBLAINS 151
– Bier's hyperæmic treatment in 92
– faradization for 286
Children, cardiac rheumatism in 775
– cerebral palsies of .. 663
– constipation in .. 183, 184
– – belladonna treatment .. 185
– convulsions in 190
– diet of, in relation to dental disease 493
– dyspepsia in 253
– fracture of femur in .. 367
– glaucoma in 384
– hyperpiesia in 82
– knock-knee in 521
– laryngismus in 529
– mental deficiency in .. 563
– – – institution treatment 565
– night terrors in 639
– nightmare in 640
– prolapse of rectum in .. 769
– splenic anæmia of .. 860
– tetany in 918
– vicious and degenerate, hypnotism in 482
– vomiting in 970
– vulvo-vaginitis in .. 973
Chloral in insomnia 495
– mental disease 578
– poisoning by 692

PAGE

Chloretone in chorea .. 155
Chlorides, restriction of, in renal dropsy 241
Chlorine poisoning 692
Chlorodyne poisoning (*see* Opium) 692
Chloroform, administration of 37
– poisoning 692
CHLOROFORM POISONING, DELAYED 152
– – – carbohydrate treatment 152
– – – dextrose in 152
– – – prophylaxis 152
Chlorosis (*see also* Anæmia) 23
– arsenic in 27
– a cause of amenorrhœa .. 23
– climatic and balneological treatment of .. 24, 28
– dietetic treatment of 24, 26
– digestive treatment of .. 24
– factors concerned in production of 23
– with heart failure .. 600
– hygienic treatment of .. 24
– iron in 25, 26, 27
– – waters in 27
– medicinal treatment of 24, 26
– spa treatment of .. 28, 446
– tonics in 26, 27
– treatment of constipation 25
Cholangitis (*see* Bile-ducts, Catarrh of)
– acute and chronic (*see also* Gall-stones) 95
– infective and suppurative 96
CHOLECYSTITIS 152
– pancreatitis secondary to.. 664
Cholecystectomy, cholecystostomy, cholecystotomy, choledochotomy, for gall-stones .. 372, 373
Cholelithiasis (*see* Gall-stones)
CHOLERA 153
– gum transfusion in .. 941
Cholesteatomata of middle ear 264
Chondromata 106
Chordee 397
Chorditis tuberosa 532
CHOREA, ACUTE RHEUMATIC 154
– – – diet in 154
– – – drugs used to combat nervous symptoms 155
– – – rest in 154
– – – salicylates in.. .. 154
– – – vaccine and serum therapy 156
CHOREA, CHRONIC 156
CHOREA GRAVIDARUM .. 156
– – diet in 157
Choroid, prolapse of .. 319
Chromic acid, poisoning by 691
Chrysarobin treatment of psoriasis 712
Chyluria 330
Cicatrices (*see* Scars)
Cicatricial entropion and ectropion 321
Ciliary body, prolapse of .. 319
– muscle, paralysis of .. 315
Circulatory disorders, spa treatment of 444
Circumcision, the operation of 676
Circumflex nerve, injuries of 624
Cirrhosis of liver 157
– – alcohol in .. 157, 158
– – ascites in 158
– – constipation in 158
– – diarrhœa in 158
– – diet in 158
– – hæmatemesis and melæna in 158

PAGE

Clamp and cautery treatment of internal piles .. 429
Claudication, intermittent .. 198
Claustrophobia (*see* Neurasthenia; Psychotherapy)
Clavicle, dislocations of .. 233
– fracture of 355
Claw-foot 904
Claw-hand, prevention in ulnar-nerve injury .. 623
Cleanliness in treatment of cancer 137
CLEFT PALATE 159
– – age at which to perform operation 159
– – Arbuthnot Lane's operation 160
– – Brophy's operation .. 162
– – hare-lip in association with 159, 432
– – Langenbeck's operation 162
– – post-operative treatment 162
Climacteric (*see* Menopause)
Climate in chronic rheumatism 783
– convalescence from acute nephritis .. 605, 608
– granular kidney, early stage 611
– hyperpiesia 86
– rheumatoid arthritis 784
– sciatica 816
Climatic and balneological treatment of chlorosis 24, 28
– causes of headache .. 439
– stations, classification of 441
– treatment (*see* Health Resorts) ..
– – of asthma 80
– – in emphysema 292
– – pulmonary tuberculosis 734
Club-foot (*see* Talipes)
Coagulating fluids, injection into aneurysmal sacs .. 45
Coal gas, poisoning by .. 692
Cocaine, contra-indication to use in hay fever .. 435
– habit (*see* Drug Habit)
– as a local anæsthetic .. 43
– – – poisoning by.. .. 43
– poisoning by 692
CŒLIAC DISEASE 163
Colchicum, poisoning by .. 692
Cold, common (*see* Rhinitis, Acute)
– in treatment of headache 440
Colectomy for chronic constipation 189
Coley's fluid in inoperable sarcoma of breast .. 116
– – sarcomata of bone .. 108
Coli cystitis 203
COLIC 164
– in children, abdominal compress in 476
– due to post-nasal catarrh 164, 165
– – gall-stones 371
– – lead poisoning 684
COLITIS (*see also* Dysentery).. 165
– – catarrhal 165
– appendicostomy in 167, 168
– colotomy in 168
– complicating measles .. 557
– diarrhœa of .. 218, 220
– mucous or membranous 166, 167
– – – spa treatment .. 167
– with rheumatism 778
COLITIS, SURGICAL TREATMENT 167
– ulcerative 167, 168
– vaccine therapy in .. 850
Coliuria causing enuresis .. 301

PAGE

COLLAPSE 168
– in infantile diarrhœa .. 224
Colles's fracture 362
Colloidal drugs in gonorrhœa 396
Colon, cancer of 143
– congenital dilatation of (*see* Congenital Dilatation of Colon)
COLON, DIVERTICULITIS OF .. 240
– – simulating cancer .. 143
– inflammation and ulceration of, ionization in .. 280
Colony system in epilepsy—list of homes 310
COLOTOMY (colostomy) .. 169
– after-treatment 170
– in colitis 168
– indications for .. 169, 768
– results of 170
– value of in hæmorrhage from cancer of rectum .. 138
Colour of patient in anæsthesia 39
Coma (*see also* Acidosis; Apoplexy; Diabetes; Poisoning, etc.)
– alcoholic 19
– diabetic 216
– following vascular occlusion 73
Compressed-air baths in emphysema 293
– illness 131
Compresses for abdomen .. 476
– in laryngitis 530
– for throat and chest .. 476
Compression of brain .. 109
– treatment of aneurysm .. 45
– – – objections to .. 47
Concomitant squint 870
Concussion of brain 110
Condyle of jaw, fracture of.. 505
Congenital ankylosis .. 60
– cataract, complete .. 144
CONGENITAL DILATATION AND HYPERTROPHY OF THE COLON 170
– – – – tetany with .. 918
CONGENITAL DISLOCATION OF HIP 170
– – – treatment in adults .. 172
– – – – early life .. 171
– – – – later childhood .. 172
– – lens 536
– dysmenorrhœa 248
– hydrocele 468
– lachrymal obstruction .. 527
– laryngeal stridor 529
– paraplegia 670
– ptosis of eyelid 320
CONGENITAL PYLORIC HYPERTROPHY 172
– – – medical treatment .. 173
– – – prognosis in 174
– – – surgical treatment 173, 174
– spastic paraplegia .. 663
– talipes 905
– torticollis 935
CONGESTION, PULMONARY, AND ŒDEMA 175
– – – oxygen in 175
– – – posture in 175
– – – venesection for .. 175
Conical cornea 196
Conium (hemlock) poisoning 692
Conjunctiva, burns and scalds of 182
CONJUNCTIVA, DISEASES OF .. 177
– – pterygium 719
– – spring catarrh 182
– – trachoma (*see also* Trachoma) 181
– – xerosis 182
– granulations of 183

PAGE

Conjunctiva, non-perforating wounds of 316
– tumours of 183
Conjunctivitis 177
– acute catarrhal 179
– angular 180
– chronic catarrhal 180
– corneal ulcer in 177, 179, 181, 182
– diphtheritic 180
– follicular 180
– gonorrhœal 178
– – complications 179
– – constitutional and local treatment 178
– – silver nitrate in .. 179
– granular (*see* Trachoma)
– membranous 180
– nitrate of silver in, method of application .. 177, 178
– phlyctenular 194
Conscious versus unconscious mind 567
Constipation, atonic 185, 188, 189
– in cancer 137
CONSTIPATION IN CHILDREN 183, 184
– – belladonna treatment .. 185
– cirrhosis of liver 158
– diabetes 217
– enuresis with 302
– faradization in 287
CONSTIPATION, HABITUAL .. 185
– – diet in 185
– – drug treatment 186, 188
– – electric treatment 186, 188
– – massage in .. 186, 188, 554
– – spa treatment 186
– – treatment by enemata 187, 188
– – water drinking for .. 186
– in infants 183
– mental disease 577
– obstructive.. .. 188, 189
– spasmodic 188
CONSTIPATION, SURGICAL TREATMENT OF 188
– – – appendicostomy .. 190
– – – colectomy 189
– – – ileosigmoidostomy .. 189
– – – short-circuiting .. 189
– in tabes 899
Contracture, Dupuytren's .. 245
Contrecoup laceration of the brain 111
Contusions of bursæ .. 130
– of eye 315
– scalp 809
CONVULSIONS, INFANTILE .. 190
– – associated with earache 191
– – from cortical hæmorrhage at birth 190
– – emetics dangerous in .. 192
– – general treatment of .. 191
– – 'inward' 190
– – in the new-born .. 190
– – at period before dentition 190
– – – of primary dentition.. 190
– – – between primary and secondary dentitions 191
– – reflex 191
– – teething 191
– in pregnancy (*see* Eclampsia)
Coolidge tube 754
Copper salts, poisoning by .. 692
Coracoid process, fracture of 357
CORNEA, DISEASES OF 192
– – abrasions 315
– – blepharospasm in 192, 195
– – conical cornea 196
– – herpes ophthalmicus .. 195
– – interstitial keratitis .. 195

PAGE

Cornea, diseases of, phlyctenular keratitis .. 194, 195
– – ulceration in conjunctivitis .. 177, 179, 181, 182
– – – dendritic 194
– – – fluorescein test .. 192
– – – foreign bodies as cause 192
– – – glaucoma following perforation .. 194, 384
– – – with hypopyon .. 193
– – – infiltrated or spreading 192, 193
– – – – – complicated with mucocele .. 193
– – – inverted lashes as cause 192
– – – ionization in 280
– – – with keratocele .. 194
– – – neuropathic 194
– – – perforating 194
– – – pneumococcal, vaccine therapy in 846
– – – simple 193
– foreign bodies in 235
– non-perforating wounds of 316
– staphylomatous, in blind eye 194
– wounds of, glaucoma following 384
Corneal reflex in anæsthesia 39
CORNS 196
– carbonic acid snow for .. 141
– soft 197
Corrosive sublimate, poisoning by 692
Corrosives, acute œsophagitis caused by 655
Cough in chronic bronchitis 122
– in pulmonary tuberculosis 740
Counter-irritant, the seton as a 823
Cracked fingers 330
– nipples 640
CRAFT PALSIES 198
– – massage in 555
CRAMP 198
Cranial bones, acute infective osteomyelitis of .. 103
Creasote for bronchiectasis .. 119
– poisoning by (Acid. Carbolic) 693
– in pulmonary tuberculosis 738
CRETINISM 198
Cricothyroidotomy for impacted foreign body—method 333
Crises of tabes dorsalis .. 899
Croton oil poisoning .. 693
CROUP 199
– preventive treatment .. 200
Croupous rhinitis 700
Crucial ligaments, rupture of 522
Cupping-glasses, Bier's hyperæmic treatment with .. 93
Cupping in valvular heart disease 455
Curettage in dysmenorrhœa 249
– lupus 649
– method in endometritis .. 296
– for nasal polypi 647
– in puerperal sepsis .. 722
CUT THROAT 200
Cutaneous affections of gout, spa treatment 446
– nerve, external, injuries of 626
Cyanide of potassium, poisoning by 693
Cyclical albuminuria 18
– vomiting 972
– – and delayed chloroform poisoning 152
CYCLITIS (*see also* Iritis) .. 501
– associated with herpes ophthalmicus 195

PAGE

Cysts of auricle 254
– bone 107
– breast 112
– dental 511
– dentigerous 511
– pancreatic 664
– tarsal 319
– – specific therapy in .. 847
Cystic disease, multiple, of breast 113
CYSTITIS 201
– acute 201
– – gonorrhœal 201
– – treatment by bladder washes and instillations 202
– – – drugs 201
– – – operation 203
– chronic 203
– – due to *B. coli* 203
– – gonorrhœal 204
– – – treatment by irrigation 204
– – simple 203
– – spa treatment 203
– – tuberculous 205
– – – drug treatment .. 206
– – – general treatment .. 205
– – – operations on bladder contra-indicated .. 205
– – – tuberculin in .. 205
– diet in 201
– in enteric fever 300
– gonorrhœal 398
– subacute 203
– vaccine therapy in .. 850
Cystocele 964

DACRYO-ADENITIS .. 524
Dacryocystitis, acute and chronic 525
Dalby's carminative, poisoning by (*see* Opium) .. 694
Damming in delayed union of fractures 355
Dandruff (seborrhœa) .. 819
Deadly nightshade, poisoning by (*see* Atropine) .. 693
Deaf-mutism (*see also* Deafness; Ear Affections) .. 266
Deafness due to adenoids 13, 14
– – drugs 266
– – faulty diet and habits .. 266
– – inflammation 266
– – injury 267
– – middle-ear catarrh .. 259
– – noisy occupations .. 267
– – syphilis 268
– Ménière's disease and .. 267
– neurasthenia due to .. 267
– senile 268
Decompression operation in fractured skull 826
– – for tumour 500
Deformities of foot (talipes).. 901
– jaws 504
– and scarring due to burns and scalds 129
Delayed union of fractures .. 355
DELHI BOIL 206
Delirium in fevers 328
– pneumonia 687
– tremens 19
Dendritic ulcer of cornea .. 194
DENGUE FEVER 206
Dental abscess 910
– caries 909
– causes of headache .. 437
– cysts 511
– disease, relation of children's diet to 493
– origin of antral suppuration 642

PAGE

Dental tissues, tumours of .. 511
Dentigerous cysts 511
Dentition, convulsions associated with .. 190, 191
Dermoid cysts of auricle .. 254
– tumours of conjunctiva .. 183
Dextrose in delayed chloroform poisoning 152
DIABETES INSIPIDUS 206
DIABETES MELLITUS 207
– – Allen and Joslin's diet scheme 211
– – anæsthesia in 217
– – balanitis in 89
– – beverages in 216
– – boils and carbuncles in 217
– – bread substitutes for .. 210
– – coma in 216
– – as a complication of cancer of breast .. 114
– – complications of .. 216
– – constipation and diarrhœa in 217
– – dietetic treatment .. 208
– – drug and hygienic treatment 216
– – eczema and pruritus in 217
– – fasting treatment .. 211
– – iritis due to 502
– – milk in 210
– – tests for sugar 207
– pruritus vulvæ with .. 709
Diabetic gangrene 374
Dial as hypnotic 496
Diaphoresis, great importance in iritis 501
– in pneumonia 686
Diaphoretics in acute nephritis 604
– chronic parenchymatous nephritis 608
– renal dropsy 241
– suppression of urine .. 962
– uræmia 952
Diaphysitis, acute 100
DIARRHŒA, ACUTE 217
– – infectious in adults .. 218
– amœbic 226
DIARRHŒA, CHRONIC .. 218
– – colitis 218, 220
– – diet and beverages in .. 219
– – from enteritis .. 218, 219
– – gastrogenic .. 218, 219
– – grouping of causes .. 218
– – pancreatic .. 218, 219
– in cirrhosis of liver .. 158
– diabetes 217
– after gastrojejunostomy .. 377
DIARRHŒA, HILL 220
DIARRHŒA, INFANTILE .. 220
– – catarrhal 220
– – chronic 224
– – collapse in 224
– – 'dysenteric' 221
– – 'lienteric' 222
– – œdema following .. 224
– – prolapsus in 221
– – septic 222
– – technique of saline infusion in 223
– lienteric 218, 220
– with measles 557
– 'morning' 218, 220
– nervous 218, 220
– in pulmonary tuberculosis 743
DIARRHŒA, TROPICAL .. 225
Diathermy (*see* Electrotherapeutics; Thermotherapy)
Diet in acute articular rheumatism 772
– – bronchitis 119
– – diarrhœa 217

PAGE

Diet in acute infectious fevers 324
– – nephritis 602
– – rheumatic fever 154
– angina pectoris 59
– Banting's 653
– in cancer 137
– – of stomach 880
– chorea gravidarum .. 157
– chronic diarrhœa 219
– – parenchymatous nephritis 606
– cirrhosis of liver 158
– cœliac disease 163
– colic 164
– colitis 166, 167
– cystitis 201
– diabetes 208
– dilatation of stomach .. 881
– duodenal ulcer 244
– dyspepsia 251
– – of childhood 253
– emphysema 293
– enteric fever 297
– epilepsy 306
– Epstein's 607
– in etiology of pruritus .. 707
– exophthalmic goitre .. 385
– flatulence 331, 332
– gall-stones 370
– gastritis 378
– gastroptosis .. 379, 380
– gonorrhœa 396
– gout 407, 410
– gouty eczema 404
– granular kidney 612
– habitual constipation 185, 188
– hyperchlorhydria 477
– infants' (*see* Infant Feeding)
– – relation to dental disease 493
– in infantile diarrhœa 222, 224
– joint tuberculosis 513
– marasmus 552
– mental disease 575
– migraine 584
– myasthenia gravis .. 593
– myocardial failure .. 595
– neuralgia 630
– neurasthenia 633
– neuritis 637
– obesity 652
– pellagra 671
– puerperal sepsis 727
– pulmonary tuberculosis .. 729
– renal dropsy 241
– rheumatoid arthritis .. 784
– rickets 796
– sciatica 815
– scurvy 818
– septicæmia and pyæmia .. 820
– sprue 869
– tetanus 917
– thoracic aneurysm .. 53
– toxæmic headaches .. 438
– tuberculous osteitis 104, 106
– – peritonitis 672
– uric acid gravel 958
– urticaria 962
– valvular disease of heart 450, 452
– vomiting of childhood .. 971
– von Noorden's 653
– in whooping-cough .. 977
Dietetic treatment 3
– – of chlorosis .. 24, 26
– – pernicious anæmia .. 29
Digestive treatment of chlorosis 24
Digitalis in myocardial failure 597
– Nativelle's digitalin 454, 597
– poisoning 693
– in valvular disease of heart 451, 454
– vomiting during exhibition of 448

PAGE

Dilatation of cervix in dysmenorrhœa 249
– colon, tetany with .. 918
– and hypertrophy of colon, congenital 170
– stomach (*see* Stomach, Dilatation of)
– in urethral stricture—technique 954
DIPHTHERIA 226
– antitoxin, method of giving 226
– – rash in 227
– cardiac failure in 228
– complicating measles .. 557
– of external auditory meatus 256
– fatty degeneration of heart in 227
– importance of rest in .. 227
– intubation for, technique 229
– laryngeal 229
– – obstruction from .. 527
– paralysis in 228
– quarantine period .. 232
– Schick's test for immunity 232
– specific therapy in .. 843
– vomiting in 228
Diphtheritic conjunctivitis .. 180
Diplegia (*see* Palsies, Cerebral) 663
Dipsomania 20
– hypnotic suggestion in 479, 481
Disinfection of mouth in operations 588
– room, etc., after fevers .. 324
DISLOCATIONS 232
– of acromioclavicular joints 233
– ankle 238
– astragalus 238
– clavicle 233
– elbow 235
– – unreduced 236
– hip 237
– – congenital (*see* Congenital Dislocation of Hip)
– jaw 232
– knee 238
– lens 315
– – congenital 536
– – glaucoma due to .. 384
– nerve injury complicating 620
– of patella 238
– radius, upper end .. 236
– shoulder 233
– – habitual 235
– – Kocher's method of reduction 234
– – subcoracoid and subglenoid 234
– – subspinous and subclavicular 234
– – unreduced 235
– spine 859
– subastragaloid 239
– of tendons 867, 913
thumb 236
– ulnar nerve 623
– wrist 236
Displaced cartilage of knee 520
Displacements of uterus .. 963
DISSEMINATED SCLEROSIS .. 239
– – massage in 555
Distal ligature in aneurysm 48
Distention, abdominal, in pneumonia 687
Diuresis in pneumonia .. 686
Diuretics in chronic nephritis 615
– of little value in apoplexy 72
– in myocardial failure 597, 598
– renal dropsy 241
– suppression of urine .. 962
– valvular heart disease .. 455
DIVERTICULITIS OF THE COLON 240

PAGE

Diverticulitis of the colon, simulating cancer .. 143
Douche-massage in rheumatoid arthritis 788
Douches 472
– hot-air 922
– – Bier's hyperæmic treatment by means of .. 49
– in puerperal sepsis .. 724
Dowsing radiant-heat apparatus 680, 921
Drainage of abscesses .. 8
– in empyema 293
– frontal-sinus operations .. 644
– gunshot wounds of joints 414
– of pelvic cavity in puerperal sepsis 722
– in puerperal sepsis 722, 724
Dream analysis in psychoneuroses 714
Dressings in wounds of soft parts 984
Drip sheet, method of applying 473
Dropsy, cardiac (*see* Heart, Valvular Disease of)
DROPSY, RENAL 240
– – diaphoretics in 241
– – indications for use of Southey's tubes .. 242
– – restriction of chlorides in 241
– – striking results with diuretics in 241
DROWNED, TREATMENT OF THE APPARENTLY 242
Drugs, deafness due to .. 266
DRUG HABIT (*see also* Alcoholism, 18) 242
– – hypnotic suggestion in 481
– – massive hyoscine doses in 243
– – treatment by bromide poisoning 243
– headache 439
Dry-mouth, or xerostomia .. 803
DUODENAL ULCER 244
– – hæmorrhage in .. 244, 245
– – Hort's treatment .. 244
– – perforation 245
– – post-operative treatment 377
– – surgical treatment .. 245
DUPUYTREN'S CONTRACTURE 245
– – ionization in 281
Dysbasia angiosclerotica .. 198
Dyschezia 185
Dysenteric diarrhœa of infants 221
DYSENTERY 246
– acute 246
– – ipecacuanha treatment 246
– – saline aperients in .. 247
– – serum treatment .. 247
– chronic or relapsing .. 247
– – vaccine therapy in .. 248
– emetine treatment in .. 247
DYSMENORRHŒA 248
– congestive 249
– spasmodic 248
– – dyspareunia due to .. 249
– static electricity in .. 292
DYSPAREUNIA (*see also* Vaginismus, 965) 249
Dyspeptic ulcers of tongue .. 928
DYSPEPSIA 249
DYSPEPSIA, ACID (*see also* Hyperchlorhydria, 477) 253
– anacid 10
– atonic (*see* Flatulence, 331; Gastroptosis, 379; Stomach, Dilatation of, 881)
– – massage for 554
DYSPEPSIA IN CHILDHOOD .. 253
– gastric and intestinal conditions mistaken for .. 250

PAGE

Dyspepsia, gouty 405
– with heart irregularity .. 447
– hygienic and dietary rules for 251
– nervous, diet in 252
– neurasthenic 633
– in pulmonary tuberculosis 729, 742
– red nose due to 648
– typical prescriptions for .. 252
– of valvular disease of heart 450, 452
Dysphagia in laryngeal tuberculosis 536
Dyspnœa in asthma .. 78
– bronchitis 119
– cardiac failure 594
– croup 199
– laryngeal tuberculosis .. 536
– pulmonary tuberculosis .. 741
– valvular disease of heart .. 499

EAR, AFFECTIONS OF .. 254
– – auricle 254
– – deaf-mutism from .. 266
– – deafness a cause of neurasthenia 267
– – – from chronic otitis media 266
– – – – suppuration .. 266
– – – due to drugs 266
– – – from otosclerosis .. 267
– – – syphilis 268
– – – toxæmia 268
– – external meatus .. 255
– – headache due to .. 437
– – internal 266
– – Ménière's disease .. 267
– – middle 258
– – tinnitus in 268
– – vertigo in .. 268, 968
– aspergillus of external meatus 255
– atresia of external meatus 255
– boils in 258
– caries of external meatus .. 256
– – ossicles 264
– carcinoma of auricle .. 254
– – external meatus .. 255
– – middle 258
– catarrh of 259
– cerumen in 256
– cysts of auricle 254
– diphtheria of external meatus 256
– eczema of auricle .. 254
– – external meatus .. 256
– endothelioma of external meatus 257
– erysipelas of auricle .. 254
– – external meatus .. 257
– Eustachian obstruction .. 259
– exostosis and hyperostosis of meatus 257
– fibroma of auricle 254
– foreign bodies in external meatus 257
– – – middle 260
– frostbite of 254
– hæmatoma of auricle .. 255
– herpes of auricle 255
– – external meatus .. 258
– inflammation of external meatus 258
– – internal ear 266
– – middle ear, acute .. 261
– – – chronic 264
– injuries of auricle 265
– – middle 265
– internal, exudation from .. 266

PAGE

Ear, internal, hæmorrhage in 266
– – inflammation 266
– – – indications for operation 267
– – – from meningitis .. 267
– – involvement in middle-ear disease 265
– – neurasthenia from affections of 267
– – otosclerosis 267
– – tinnitus from anæmia of 266
– lupus of auricle 255
– malformations of auricle .. 255
– method of catheterization 260
– – using Politzer's bag .. 259
– – syringing 256
– middle, acute inflammation of 261
– – – – Bier's hyperæmic treatment in .. 93
– – – – the mastoid operation 262
– – – – opening the membrane 261
– – – – purification and plugging 261
– – chronic inflammation of 263
– – – – artificial membrane in 264
– – – – cholesteatomata in 264
– – – – facial paralysis from 265
– – – – labyrinth involved in 265
– – – – polypi and granulations in 264
– – inflammation of, adenoids with 261, 263
– – – in scarlet fever .. 810
– – – specific therapy in .. 847
– – relation of facial paralysis to 626
– papilloma of auricle .. 255
– – external meatus .. 258
– perichondritis of auricle .. 255
– polypi of 258
– – and granulations of middle 264
– sarcoma of external meatus 258
– – middle 265
– syphilis of auricle 255
– – middle 265
– tuberculosis of, adenoids with 266
– – internal 268
– – middle 265
Earache, convulsions associated with 191
Ebstein's dietary for obesity 653
ECLAMPSIA 269
– emptyings of uterus in .. 272
– features indicating bad prognosis 269
– gastric lavage in 273
– neonatorum 190
– noisy and restless patients 273
– post-partum 269
– preventive treatment .. 269
– saline infusions in .. 272
– threatened 270
– toxin causing 269
– venesection in .. 271, 272
ECTOPIA TESTIS 915
Ectropion 321
– due to burns 129
– epiphora due to 525
ECZEMA 273
– of auricle 254
– chronic, carbonic acid snow for 141
– in diabetes 217
– external auditory meatus 256

PAGE

Eczema, gouty 404
– high-frequency current in 290
– of nails 601
– nipple 640
– radiotherapy in 755
– radium treatment 766
– specific therapy in .. 847
Education of epileptic children 307
– mentally deficient children 565
Effleurage, method of .. 552
Elastic constriction, Bier's method of 91
Elaterium poisoning .. 693
Elbow, amputation stump .. 884
– bony ankylosis of 63
– dislocations of 235
– – unreduced 236
– fractures near and into .. 360
– miner's 130
– old wounds of, ulnar neuritis with 623
– tuberculous disease of .. 516
Electric lamps, use in photo-therapy 679
– light baths 920
– – – in gout 403
– osmosis (*see* Electrotherapeutics, Ionization)
ELECTROTHERAPEUTICS .. 275
– in acne 11, 290
– action and properties of galvanic current .. 277
– acute poliomyelitis .. 696
– apparatus for 275
– in arthritis 281
– atony of sphincter urethræ 302
– the cell-collector 275
– for chilblains 268
– in chronic rheumatism .. 782
– constipation 287
– – habitual .. 186, 188
– diathermy in eczema .. 290
– – fibromata of nasopharynx 292
– – gonococcal infections .. 290
– – high blood-pressure .. 290
– – nævi, warts, etc... 291, 292
– – neuritis 290
– – new growths 291
– – pain and spasm from hæmorrhoids 291
– – paralysis agitans .. 291
– – patients who constantly complain of cold .. 290
– – principles of 288
– in eczema 290
– electrodes 276
– electrolysis .. 278, 282
– – for angeiomata 56
– – bipolar needle-holder for 283
– – in keloid 518
– – for moles and nævi .. 283
– – in removal of superfluous hairs .. 282, 430
– – thoracic aneurysm .. 54
– – for warts and papillomata 284
– in exophthalmic goitre .. 385
– paralysis 322
– the faradic current, action and properties 284
– in fibrositis 287
– galvanism—method .. 281
– general faradization—method 288
– in headache .. 292, 440
– hemiplegia 286, 459
– high-frequency, principles of 288
– in hyperpiesia 86
– hysteria 287
– incontinence of urine .. 287

PAGE

Electrotherapeutics in infantile paralysis 286
– insomnia 287
– ionization in eye diseases .. 280
– – gout 403
– – infections of uterus and vagina 280
– – inflammation and ulceration of rectum and colon 280
– – keloid 518
– – lumbago 542
– – medical—methods of 278, 279
– – peripheral neuritis .. 281
– – proctitis 705
– – rectal fissure 280
– – rodent ulcer 801
– – scar tissue and adhesions 280
– – sinuses 280
– – skin diseases 280
– – for sprains 869
– – surgical—methods 278, 282
– – in ulcers .. 279, 280
– in lead poisoning 685
– lupus erythematosus .. 543
– – vulgaris 545
– menstrual disorders .. 292
– mental fatigue and neurasthenia 282
– the milliampèremeter .. 276
– in muscular and nervous disorders 292
– neuralgia 282, 629
– neurasthenia .. 287, 292
– neuritis 282, 637
– obesity 287
– paralysis 285
– pruritus 709
– psoriasis 713
– psychic influence of static electricity 292
– in Raynaud's disease 282, 374
– relief of pain 289
– rheumatoid arthritis .. 787
– scars and adhesions 812, 813
– sciatica 815
– source of faradic current .. 277
– – galvanic current .. 275
– in sprains 866
– static electricity 292
– with suggestive treatment in hysteria 485
– suggestive use in mental disease 577
– in synovitis .. 888, 889
– tabes 897
– vertigo 968
Elephantiasis 330
Embolism, cerebral (*see* Apoplexy, 67; Hemiplegia, 456)
Emerald green (arsenic) poisoning 693
Emetics dangerous in infantile convulsions 192
Emetine in hæmophilia .. 418
– treatment of dysentery .. 247
EMPHYSEMA 292
– compressed-air baths in .. 293
– drug treatment 293
– general and climatic treatment 292
– obesity with 293
Empirical treatment .. 2
EMPYEMA 293
– aspiration for 293
– of the gall-bladder .. 153
– incision for 294
– post-operative treatment 295
– rib resection for 294
– specific therapy in .. 846

PAGE

Encephalitis, acute 695
ENCEPHALITIS LETHARGICA .. 296
Enchondroma of nose .. 650
Endocarditis 771
– infective, specific therapy in 845
ENDOMETRITIS, CHRONIC .. 296
– method of curetting .. 296
Endoscopy of air-passages and œsophagus 337
Endotheliomata of bone .. 107
– external auditory meatus 257
– mouth and pharynx .. 586
– radium treatment 764
– (*see also* Cancer; Malignant Disease)
Enemata in habitual constipation 187, 188
– nutrient, in valvular disease 452, 455
Energy, relation to mental disease 567
Entamœba hystolytica, presence of, indicating treatment 246, 247
ENTERIC FEVER (*see also* Fevers, Acute Infectious, 323) 297
– – abdominal compress in .. 476
– – Brand bath in—method 471
– – Bull's and other baths in 326
– – cystitis in 300
– – diet in 297
– – perforation in 298
– – serum and vaccine treatment .. 300, 839, 851
– – thrombosis in 300
– – tympanites and hæmorrhage in 298
Enteritis, chronic diarrhœa from 218, 219
Enterocolitis of children, abdominal compress in 476
Enteroptosis (*see* Gastroptosis, 379; Kidney, Movable, 519)
Entropion 321
ENURESIS (in Childhood) .. 300
– adenoids causing 300
– from alkaline urine .. 301
– bacilluria causing 301
– bladder irritation causing 301
– constipation with 302
– drug treatment 302
– epidural injection for .. 302
– hypnotic suggestion in .. 302
– vaccine therapy in .. 301
Epidemic cerebrospinal meningitis 558
Epididymis, hydrocele complicating disease of .. 467
Bier's hyperæmic treatment 92
– gonorrhœal 397
– diathermy in 290
EPIDIDYMITIS, TUBERCULOUS 303
Epidural injection of saline infusion in enuresis .. 302
Epiglottis, removal of, in tuberculosis of larynx .. 535
Epilation, electric—technique 282
– *x*-ray, in favus 323
– – ringworm 799
EPILEPSY 305
– arrest of an attack .. 305
– diet in 306
– drug treatment 307
– education and occupation 307
– Jacksonian 305
– list of homes and colonies 310
– post-epileptic phenomena 305
– the question of marriage .. 307

PAGE

Epilepsy, seton treatment .. 823
– status epilepticus 306
– surgical treatment .. 309
– traumatic 310
– treatment of an attack .. 305
Epithelioma of anus .. 65
– conjunctiva 183
– jaw 509, 510, 511
– larynx 532
– lip 590
– mouth and pharynx .. 585
– radium treatment of .. 760
– (*see also* Cancer)
Epiphora 524
Epiphyses of humerus, separation of 359, 360
EPISCLERITIS .. .. ..
EPISTAXIS 311
– when beneficial 311
– rhinitis and telangiectases in causation 312
Epstein's diet in chronic nephritis 607
Epulis 508
Equinovalgus 904
Equinovarus, acquired .. 903
Equinus, congenital 905
– paralytic 902
Erb-Duchenne (birth) paralysis 97
Ergotine injections for aneurysm 45
Eructatio nervosa 332
Eructations, offensive .. 332
ERYSIPELAS 312
– in alcoholics 313
– of auricle 254
– external auditory meatus .. 257
– specific therapy in .. 845
ERYTHEMA 313
– in antitoxin treatment of diphtheria 227
– induratum scrofulosorum 313
– iris 314
– multiforme 314
– nodosum 779
ERYTHROMELALGIA 314
Escharotic paste, removal of tonsils with 934
Eserine poisoning (*see* Physostigmine) 694
Ether, administration of .. 36
– poisoning (*see* Chloroform) 692
Ethmoidal sinusitis .. 642, 645
Ethyl chloride, administration of 35
Eustachian obstruction .. 259
– – method of catheterization 260
– – – using Politzer's bag .. 259
Euthanasia 4
Eversion of punctum, epiphora due to 525
Excision of sac in treatment of aneurysm 48
– treatment of internal piles 428
Exercise for epileptics .. 307
– in myocardial failure .. 593
– obesity 654
– pulmonary tuberculosis .. 731
– rheumatoid arthritis .. 784
– rickets 798
– valvular disease of the heart 449, 453
Exercises, breathing, for adenoids 17
– in cerebral palsies of childhood 663
– chronic rheumatism .. 782
– for mentally deficient children 564

PAGE

Exercises in paralysis agitans 665
– poliomyelitis 636
– re-educative, in the psychoneuroses 719
– in scoliosis 816
– tabes dorsalis 898
– tics 925
Exophthalmic Goitre (*see* Goitre, Exophthalmic) ..
Exostosis of external auditory meatus 257
Expectant treatment .. 2
Expectoration in pulmonary tuberculosis 741
Extension methods in fractures 353
– – – of thigh 365
External cutaneous nerve, injuries of 626
Extirpation of larynx, total 533
Extrasystoles, arrhythmia due to 108, 447
Exudation from internal ear 266
Eye affections, headache due to 437
– blind, with staphylomatous cornea 194
– burns of 129
– care of, in small-pox .. 828
– diseases, ionization in .. 280
EYE, INJURIES OF 314
– – abrasions of cornea .. 315
– – after-treatment .. 315, 319
– – contusions 315
– – dislocation of lens .. 316
– – foreign bodies .. 315, 317
– – glaucoma following .. 384
– – intra-ocular hæmorrhages 316
– – paralysis of ciliary muscle 315
– – – or rupture of sphincter iridis 315
– – with perforation .. 316
– – without perforation .. 314
– – prolapse of uveal tissue 318
– – rupture through contusions 315
– – septic 317
– – sympathetic ophthalmia after 658
– – wounds of lens 318
– – – sclerotic 319
– method of bathing .. 503
– squint and associated defects 870
– symptoms in section of sympathetic nerve .. 628
Eyelashes, inverted, as cause of corneal ulcer 192
EYELIDS, DISEASES OF .. 319
– – blepharitis 320
– – entropion and ectropion 321
– – epicanthus 320
– – Meibomian cyst 320
– – ptosis 320
– – stye 320

FACIAL nerve, injuries of 626
FACIAL PARALYSIS (Bell's Palsy) 322
– – electrotherapy in .. 322
– – faradization in 285
– – from middle-ear disease 265
– – nerve anastomosis in 322, 626
– – with otitis media .. 626
FACIAL SPASM 328
– veins, phlebitis of 678
Faddiness to be avoided in treatment 1
Fæcal fistula as a complication of acute appendicitis .. 76
Faradic current (*see* Electrotherapeutics)

PAGE

Fasting treatment of diabetes 211
Fats in foods, tables of 212–15
FAVUS 323
Femoral hernia 464
Femur, amputation stumps of 885
– fractures of (*see* Fractures)
FEVERS, ACUTE INFECTIOUS 323
– – – baths in (*see also* Hydrotherapy, 471) .. 326
– – – bed-sores in 328
– – – delirium in 328
– – – diet and drink in .. 324
– – – disinfection of room in 324
– – – headache in 328
– – – mouth-washes in .. 328
– – – preparation of room and bed for .. 323
– – – quarantine and school regulations .. 328
– – – retention of urine in 328
– – – sponging and packs in 325
– – – stimulants in.. .. 325
Fibrillation, auricular, tachycardia due to 900
Fibro-adenomata of breast 112
Fibro-angeioma of septum nasi 650
Fibrocystic disease of jaw .. 511
FIBROIDS (FIBROMYOMATA) OF UTERUS 329
– – indications for operation 329
– – radium treatment .. 765
– – *x* rays and radium in .. 329
Fibrolysin injections for sprains 869
Fibroma of auricle 254
– nasopharynx, diathermy in 292
– nose 650
Fibrosarcomata of jaw .. 509
Fibrositis (*see also* Rheumatism, Chronic) .. 781
– faradization in 287
– lumbago due to 541
Fibrous ankylosis 62
– odontomes 511
Fibula, fracture of 369
FILARIASIS 330
FINGER CRACKS 330
– fracture of bones of .. 363
– incision for whitlow .. 975
– rupture of tendons of .. 912
– trigger 942
– tuberculous disease of .. 515
Finsen rays in lupus vulgaris 546, 680
First aid in gunshot wounds 411
Fissure of anus 65
– of nipple 640
– œsophagus 655
Fistula in ano (*see also* Abscess, Ischiorectal) 66
– biliary 96
– fæcal, as a complication of acute appendicitis .. 76
– gastrojejunocolic 377
– of lachrymal sac 527
– salivary 806
FLAT-FOOT 330
– associated with hallux rigidus 431
FLATULENCE 331
– with chronic diarrhœa .. 220
– gastric 331
– intestinal 332
– nervous 332
– palpitation due to .. 662
– in relation to dyspepsia .. 250
– valvular disease of heart 450
Flexion of limb in treatment of aneurysm 47
Flies in etiology of acute poliomyelitis and encephalitis 695

PAGE

Fluorescein test in corneal ulcer 192
Flutter, auricular, tachycardia due to 900
Fly papers, poisoning (Arsenic) 691
Follicular conjunctivitis .. 180
– odontomes 511
Folliculitis, gonorrhœal .. 397
Fomentations, method of making 919
Food fever 972
Foods, iron contents of .. 26
– list of most digestible .. 251
– suitable and unsuitable, in gout 410
– tables of, for diabetes 208–15
– (*see also* Diet)
Foot, amputation stumps .. 884
– aneurysm of 51
– deformities of (Talipes) .. 901
– flat, weak, everted .. 330
– – with hallux rigidus .. 431
– fractures of bones of .. 369
– injuries of tendons of .. 913
– Morton's disease of the .. 583
– tuberculous disease of .. 516
FOREIGN BODIES IN AIR-PASSAGES AND ŒSOPHAGUS .. 332
– – – bloodless method of tracheotomy in .. 334
– – – deliberate cases .. 336
– – – direct laryngoscopy .. 338
– – – emergency cases .. 334
– – – endoscopy in .. 337
– – – in anatomical details 338
– – – hypopharyngoscopy .. 338
– – – methods of examination 335, 340
– – – – œsophagoscopy in 341
– – – nature, detection, and treatment 345
– – – tracheobronchoscopy in 339
– – as cause of corneal ulcer 192
– – in ear 257, 260
– – eye 315, 317
– – introduction into aneurysmal sacs .. 45
– – – sac of thoracic aneurysm 54
– – laceration of œsophagus by 655
– – laryngeal obstruction by 529
– – in nose 646
– – œsophagus, nature, detection, and treatment .. 347
– – – œsophagotomy for .. 347
– – stomach 882
Formalin poisoning 693
Foxglove poisoning 693
FRACTURES 349
– beds for 366
– Bennett's 363
– of carpal bones 362
– choice of apparatus .. 354
– clavicle 355
– Colles's 362
– 'damming' in delayed union 355
– delayed union 355
– diagnosis of 353
– of femur 363
– – in children 367
– – above condyles .. 367
– – distinction of intra- and extra-capsular .. 364
– – extension methods .. 365
– – into knee-joint 367
– – below lesser trochanter 365
– – the middle third .. 365
– – the neck 364
– general principles 349
– due to gunshot wounds .. 413
– 'hammering' in delayed union 355

PAGE

Fractures of humerus .. 357
– – the anatomical neck .. 358
– – the greater tuberosity.. 358
– – near and into elbow-joint 360
– – separation of upper epiphysis 359
– – the shaft 359
– – the surgical neck .. 358
– – upper end 357
– indications and contra-indications for immediate operation 354
– involving middle ear .. 265
– of jaw 504
– – the alveolus 505
– – canine fossa 505
– – condyle 506
– – four-tailed bandage for 505
– – necrosis due to 506
– – the superior maxilla .. 506
– massage and movement in 349
– of metacarpal bones .. 363
– metatarsal bones 370
– nerve injury complicating 620
– of nose 646
– olecranon 360
– patella 368
– pelvis 363
– Pott's 369
– – voluntary effort of patient 352
– of radius and ulna .. 361
– ribs 363
– scapula 356
– skull 826
– spine 857
– tarsal bones 369
– tibia and fibula 368
– use of extension 353
– – splints in 353
Fracture-sprains 866
Frambœsia tropica 990
FRECKLES 370
Freezing to produce local anæsthesia 43
Freud's methods of psychoanalysis 714
Friction massage, method .. 553
Frontal sinus, suppuration in 642, 643
Frostbite of auricle 254
Fruit cure in sprue 870
Fruits for diabetics 208
– gouty patients 409
Functional albuminuria .. 18
– paralysis supervening on hemiplegia 458
Fungi, poisoning by.. .. 693
Furunculosis (*see* Boils ; Carbuncle)

GALACTOCELES .. 113
Gall-bladder disease, pancreatitis secondary to 664
– empyema of 153
– inflammation of (*see* Cholecystitis)
Gallois' treatment of boils .. 99
GALL-STONES (*see also* Cholecystitis, 152) 370
– diet and exercise in .. 371
– olive-oil treatment .. 370
– palliative treatment 370, 372
– relation to cancer 371
– surgical treatment .. 372
Galvanic current, path through body 270
– – regulation of 271
– – source of.. 273
– – therapeutic action and properties of 277

PAGE
Galvanic Current (*see also* Electrotherapeutics)
Galvanopuncture of aneurysms 45
– in thoracic aneurysm .. 54
GANGLION 373
GANGRENE 373
– diabetic 217, 374
– dry 373
– gas, in gunshot wounds .. 412
– moist 374
– Raynaud's disease 374, 767
– senile 374
– spreading traumatic .. 375
Gangrenous stomatitis .. 883
Garlic for bronchiectasis .. 119
Gas gangrene in gunshot wounds 412
Gasserian ganglion, alcohol injections in trigeminal neuralgia 629, 631
– – operation on .. 629, 631
GASTRALGIA (*see also* Dyspepsia) 375
Gastric crises of tabes .. 899
– derangements of children, vomiting in 970
– flatulence 331
– lavage in dilatation .. 881
– – in eclampsia 273
GASTRIC ULCER (*see also* Duodenal Ulcer, 244; Hæmatemesis, 415) .. 375
– – chronic 376
– – hæmatemesis in .. 376
– – hour-glass stomach .. 376
– – perforation 376
– – post-operative treatment 377
– – surgical treatment .. 375
– vertigo 968
GASTRITIS, ACUTE AND CHRONIC 378
– diet in 378
– typical prescriptions for .. 252
Gastro-enterostomy for congenital pyloric hypertrophy 173
Gastrogenic diarrhœa 218, 219
Gastro-intestinal disorders in rheumatism 778
– – salivation due to .. 802
– – in phthisis 742
Gastrojejunostomy in cancer 880
– complications after .. 377
– in duodenal ulcer 245
– gastric ulcer 376
GASTROPTOSIS 379
– co-existing functional disorders 379
– diet in 379
– relation to neurasthenia .. 379
– typical prescriptions for .. 252
Gastrostaxis 415
Gastrostomy and jejunostomy in cancer 881
Gelatin injection in thoracic aneurysm 55
Gelsemium poisoning .. 693
Genital herpes 466
– pruritus 708
Genu valgum (*see* Knock-knee, 523), unreduced dislocations of patella due to 238
Giant urticaria 963
Gibson's vermin killer, poisoning by 693
Giddiness (*see* Vertigo)
GLANDERS 380
Glands, tuberculous (*see* Tuberculous Glands)
GLAUCOMA 380
– buphthalmos 384

PAGE
Glaucoma with cataract and no light perception .. 384
– chronic 382
– complicating iritis .. 383
– diagnosis from iritis .. 381
– following wounds 384
– with interstitial keratitis 195
– iridectomy for 383
– with iritis 501, 504
– primary 381
– secondary 383
– threatened 381
– trephining for 382
Glénard's disease (*see also* Gastroptosis) 379
Glossitis, acute and chronic 928
Glottis, œdema of 528
Gluteal aneurysm 50
GLYCOSURIA 384
Godfrey's cordial, poisoning by (Opium) 693
GOITRE, EXOPHTHALMIC .. 385
– – diet and hygiene in .. 385
– – electricity in 385
– – medicinal treatment .. 386
– – radiotherapy in 385, 756
– – radium treatment .. 766
– – serum treatment .. 386
– – surgical treatment 387, 391
– – operations for 394
GOITRE, SIMPLE PARENCHYMATOUS 387
– – – relation to water supply 387
– – – surgical treatment .. 391
GOITRE, SURGICAL TREATMENT (*see also* Thyroid) .. 388
– – – after-treatment .. 394
– – – for control of generalized disease 391
– – – deformity 389
– – – enucleation 393
– – – general features .. 393
– – – hemithyroidectomy .. 393
– – – post-operative tetany 394
– – – for pressure symptoms 389
– – – relief of hyperthyroidism 390
– – – scope of 388
– – – thyroid grafting .. 392
– – – for 'tumours' .. 389
Gonococcus, effect of heat on 395
GONORRHŒA 394
– abortive treatment .. 395
– abscess of Bartholin's glands in 400
– Bier's method in 395
– chordee from 397
– colloidal drugs in 396
– complications of 397
– diet in 396
– in the female 399
– retention of urine in .. 959
– seminal vesiculitis with .. 397
– specific therapy in .. 849
– thermal treatment .. 395
– vaccine therapy in .. 396
– vaginal and vulval .. 399
Gonorrhœal arthritis, vaccine therapy in 849
– – Bier's hyperæmic treatment in 92
– – diathermy in 290
– – galvanism in 281
– conjunctivitis (*see* Conjunctivitis, Gonorrhœal)
– cystitis 398
– – acute 201
– – chronic 204
– epididymitis 397

PAGE
Gonorrhœal epididymitis, Bier's hyperæmic treatment in 92
– – diathermy in 290
– – stimulating tuberculosis 304
– folliculitis 397
– iritis 399, 501
– – vaccine therapy in .. 849
– lymphangitis 397
– ophthalmia 399
– orchitis, diathermy in .. 290
– proctitis 704
– prostatocystitis 204
– rheumatism 398
– vulvo-vaginitis 974
– warts or vegetations .. 400
GOUT 400
– alcohol in 400
– alkalis in 401
– checking formation of toxic agents 401
– dangers of Turkish bath in 404
– diet in 407
– elimination of the toxic agents 401
– heart irregularity in .. 447
– irregular forms of .. 404
– local treatment of the joints 402
– massage, electricity, and baths in 403
– preventive treatment .. 405
– relation of respiratory disorders to 444
– spa treatment 402, 406, 443, 473
– – – classification of various waters 407
– subacute and chronic .. 401
– treatment of the paroxysm 400
Gouty arthritis, galvanism in 281
– – radium treatment .. 767
– dyspepsia 405
– eczema 404
– hepatic torpor 405
– hyperchlorhydria 404
– insomnia 405
– iritis 502
– lumbago 540
– phlebitis 405
– symptoms in valvular disease 455
Grafting of skin after burns and scalds 129
– thyroid 392
Grafts, cartilage, after frontal-sinus operation 644
– – for 'saddle-backed' nose 649
Granular conjunctivitis (*see* Trachoma)
GRANULAR KIDNEY (*see also* Nephritis, Chronic) .. 609
– – contributory causes .. 609
– – the early stage 610
– – – – avoidance of chills 611
– – – – climatic considerations in 611
– – – – clothing and hygiene 611
– – – – diet in 612
– – – – the digestive system 612
– – – – muscular exercise in 612
– – intermediate stage .. 613
– – – – cardiac treatment 613
– – – – changes in vessels in 613
– – – – intestinal diseases in 614
– – – – surgical operations in 614
– – late stage of 615
– – – – chronic toxæmia in 615
– – – – pilocarpine in .. 615
– – – – restlessness, sleeplessness, and delirium in 615
Granulations of conjunctiva 183
Granulomata of jaw .. 509

PAGE

Gravel (*see* Calculus, Renal; Oxaluria; Phosphaturia; Uric Acid Gravel)
Graves' disease (*see* Goitre, Exophthalmic)
Groves' operation in ruptured crucial ligaments .. 522
Growth fever 100
Guillotine method of tonsillectomy 932
Gumboil (*see* Teeth, Caries of)
Gum transfusion (*see* Transfusion)
Gums, tumours of (*see* Jaws, Tumours of)
GUNSHOT WOUNDS 411
– – of abdomen 414
– – blood-vessels 413
– – – secondary hæmorrhage 413
– – bones 413
– – chest 414
– – first aid in 411
– – gas gangrene in .. 412
– – general treatment .. 412
– – of joints 413
– – – drainage in 414
– – nerves (*see* Nerves, Peripheral)
– – skull 414

HABIT spasms in childhood (*see* Tics)
HÆMATEMESIS 415
– in cirrhosis of liver .. 158
– due to crack on tongue .. 988
– with duodenal ulcer 244, 245
– gastric ulcer .. 376, 415
– or melæna as a complication of acute appendicitis 76
Hæmatochyluria (*see* Filariasis)
Hæmatoma of auricle .. 255
– the new-born, torticollis due to 935
– with sprains 865
HÆMATURIA 415
– in granular kidney .. 613
– localizing symptoms .. 415
Hæmoglobinuria (*see* Blackwater Fever; Raynaud's Disease)
HÆMOPHILIA 417
– blood transfusion in .. 937
– neonatorum, blood transfusion in 937
HÆMOPTYSIS 418
– in valvular disease .. 453
Hæmorrhage (*see also* Wounds of Arteries and Veins) 985
– in cancer, treatment of .. 138
– cerebral (*see* Apoplexy; Hemiplegia)
– in dilatation of urethra .. 957
– from divided or broken bone 989
– in duodenal ulcer 244, 245
– enteric fever 298
– with entrance of air into veins 986
– from an extremity .. 989
– gastric 376, 415
– in granular kidney .. 613
– gum transfusion in .. 941
– in gunshot wounds, first-aid treatment 411
– from intercostal artery .. 989
– in internal ear 266
– intestinal (*see* Duodenal Ulcer)
HÆMORRHAGE, INTRACRANIAL 420
– – extradural 420
– – intradural 421

PAGE

Hæmorrhage, intra-ocular .. 315
– from the lungs 418
– nasal (*see* Epistaxis)
– in œsophagus 655
– from palmar and plantar arches 987
– paraplegia with 668
– purpuric 744
– from rectum 989
– renal 415, 416
– from scalp 987
– secondary 986
– – in gunshot wounds .. 413
– severe primary, blood transfusion in.. 936
– after tooth-extraction 911, 988
– from tonsil 987
– after tonsillectomy .. 932
HÆMORRHAGE, UTERINE 421, 989
– – accidental 422
– – ante-partum 421
– – concealed 423
– – post-partum 424
– – from tears 425
– – unavoidable 423
– from varicose veins .. 967
– venous 986
– vesical .. 415, 416, 417
– from wounds 982
HÆMORRHAGIC DISEASE OF THE NEWLY-BORN .. 425
HÆMORRHOIDS 426
– diathermy in pain and spasm from 291
– external 426
– internal 426
– – carbonic acid snow for 142
– – indications for operations 427
– – operative treatment .. 427
– – – carbolic acid injections 427
– – – clamp and cautery 429
– – – excision 428
– – – ligature 427
– – – stretching of sphincter 427
– – – Whitehead's operation not recommended 429
– – palliative treatment .. 426
Hæmothorax in gunshot wounds of chest .. 414
HAIR, DISEASES OF 429
– – alopecia 429
– – areata 22
– – baldness 429
– – canities 430
– – hirsuties 430
– – seborrhœa 429
Hairs, electrolysis in removal of 282
– *x* rays in removal of .. 755
HALLUX RIGIDUS 430
HALLUX VALGUS AND BUNION 431
HAMMER-TOE 431
– as a cause of corns .. 196
– with hallux valgus and bunion 431
Hammering in delayed union of fracture 355
Hand, fracture of bones of .. 362
HARE-LIP 432
– associated with cleft palate 159
Harrogate hot-air bath .. 922
Hartshorn, spirit of, poisoning by (*see* Caustic Potash) 692
HAY FEVER 434
Head and neck, septic conditions of, Bier's hyperæmic treatment in .. 92
– nodding and nystagmus .. 652
– wounds of (*see* Brain; Scalp; Skull)

PAGE

Head and Riddoch's 'mass-reflex' in paraplegia .. 669
HEADACHE 435
– from abdominal and thoracic affections 437
– cyclical vomiting with .. 972
– drug treatment 441
– electricity in 440
– in fevers 328, 439
– from high blood-pressure 438, 441
– indigestion toxæmia .. 438
– massage in .. 436, 440, 554
– from mental causes .. 439
– migraine 583
– neuralgic 436, 441
– organic 435
– from peripheral irritation 436
– rheumatic 436
– seton treatment .. 440, 823
– static electricity in .. 292
– syphilitic 435, 441
– topical treatment 440
– uræmic 439
HEALTH RESORTS (*see also* Spa Treatment, and Climatic Treatment) .. 441
– – classification of .. 441
– – in emphysema 293
Heart, acute rheumatism of 775
– affections, spa treatment of 445
– dilatation of (*see* Myocardial Failure)
– failure (*see* Myocardial Failure) 593
– – in bronchitis .. 121, 124
– – in diphtheria .. 227, 228
– – pneumonia, to prevent or treat 687
– fatty (*see* Myocardial Failure)
HEART, IRREGULARITIES OF 447
– – due to auricular fibrillation 109, 448
– – extrasystoles .. 108, 447
– – sinus arrhythmia .. 449
HEART, VALVULAR DISEASES OF 449
– – – anginal pain in .. 453
– – – breakdowns of compensation 451
– – – diet in .. 450, 452
– – – dropsy in .. 453, 455
– – – drugs used in .. 454
– – – dyspepsia and flatulence in .. 450, 452
– – – exercise in .. 449, 453
– – – hæmoptysis in .. 453
– – – high blood-pressure in 453
– – – mental therapeutics in 454
– – – Nauheim and Oertel treatment .. 451, 452
– – – rest in .. 450, 453
– – – sedatives and soporifics in 455
– – – slight, compensated lesions 449
– – – symptoms and secondary results 453
– – – venesection and cupping in 455
– weakness with granular kidney 613
– – in mental disease .. 577
Heart-block (*see* Bradycardia)
HEARTBURN 456
– in pregnancy 698
Heat apoplexy (*see* Sunstroke)
– in treatment of acute nephritis 604
– – brachial neuralgia .. 629
– – gout 403
– – of headache 404

PAGE

Heat in treatment of lumbago 542
– – for relief of pain in cancer 138
– – in sciatica 814
– – sprains 865
– – Tyrnauer's apparatus .. 921
– – (*see also* Thermotherapy) 919
Heated air, Bier's hyperæmic treatment by means of 93
Hebra's prescription for lupus 544
Heel, affection of bursa adjoining 131
HELIOTHERAPY 456
– in tuberculous disease of joints 513
Hemicrania, seton treatment 823
HEMIPLEGIA 456
– aphasia in 66
– apraxy in 461
– ataxy in 461
– disordered association in .. 461
– early treatment of rigidity 458
– faradization in 286
– functional or hysterical paralysis supervening on 458
– massage and electricity in 459
– mechanotherapeutics in .. 459
– passive movements in .. 458
– prevention of articular lesions 458
– re-education of movements, and therapeutic suggestion 460
– summary of treatment .. 461
Hemithyroidectomy 393
Hemlock (conium) poisoning by 692
HEPATIC ABSCESS 462
– torpor, gouty 405
HEPATITIS 462
Heredity and mental disease 570
HERNIA 462
– femoral 464
– inguinal 462
– – excision of the sac .. 463
– – in infants 464
– – Kocher's and Bassini's operations 463
– – in women 463
– in muscles 867
– strangulated .. 464, 465
– truss treatment 462
– umbilical 465
– ventral 465
HERPES 465
– of auricle 255
– external auditory meatus 258
– genitalis 466
– labialis 466
– ophthalmicus 195
– zoster 465
Hibbs' operation in spinal caries 854
HICCOUGH 466
High arterial tension (*see* Atherosclerosis; Blood-pressure)
High-frequency current (*see* Electrotherapeutics
Hill diarrhœa 220
Himrod's cure for asthma .. 79
Hip, affections of bursæ in region of 131
– bony ankylosis of .. 63
– congenital dislocation of (*see* Congenital Dislocation of Hip)
– dislocation of 237
– tuberculous disease of .. 517
Hirschsprung's disease .. 170
Hirsuties 430
– electrolysis for 282
– *x* rays in 755

PAGE

Histrionic spasm 323
Hordeolum 320
Hort's treatment of duodenal ulcer 244
Hot-air baths (*see* Heat)
Hour-glass stomach with gastric ulcer 376
Housemaid's knee 130
Humerus, amputation stump 884
– fractures of (*see* Fractures)
Hydatid cysts of breast .. 113
– disease of liver 539
– mole at the menopause .. 563
HYDROCELE 467
– chronic, complicating testicular disease 467
– – vaginal 467
– congenital and infantile .. 468
– encysted 468
– right and wrong methods of tapping 467
HYDROCEPHALUS 468
Hydrochloric acid, poisoning by 691
Hydrocyanic acid, poisoning by 691
Hydrogen peroxide for chilblains 151
HYDRONEPHROSIS 469
Hydrophobia (*see* Rabies)
HYDROTHERAPY 470
– in acute nephritis .. 604
– baths (*see* also Baths) .. 470
– in early stage of granular kidney 611
– mental disease 576
– mumps with fever and nerve symptoms .. 592
– packs 473
– in sprains 868
– sunstroke 886
– tabes 897
HYDROTHORAX 477
Hygienic rules in dyspepsia 251
Hyoscine and hyoscyamus poisoning (*see* Atropine) 692
– in infantile convulsions .. 191
– treatment of drug habit .. 243
Hyperacid urine, enuresis due to 301
Hyperacidity with heartburn 456
Hyperæmic areas, effect of seton treatment .. 823
– treatment (*see* Bier's Hyperæmia)
Hyperæsthesia (gastralgia), typical prescriptions for 252, 253
Hyperalgesia after nerve injuries 620
HYPERCHLORHYDRIA .. 477
– gouty 404
– typical prescriptions for .. 252
HYPERIDROSIS 478
– *x* rays in 756
Hyperostosis of external auditory meatus 257
Hyperpiesia 82
– in children 82
– climate in 86
– electricity in 86
– venesection in 84
Hypersecretion, typical prescriptions for .. 252, 253
Hyperthyroidism, indications for operation 390
Hypertrichosis, electrolysis for 282
– *x* rays in 755
Hypertrophic laryngitis .. 532
– rhinitis 792
Hypertrophied synovial membrane of knee-joint .. 522

PAGE

Hypertrophy of breast .. 111
– and dilatation of the colon, congenital 170
– of prostate 705
– pylorus, congenital (*see* Congenital Pyloric Hypertrophy)
Hypnotic action of seton treatment 823
– analysis in the psychoneuroses 714
– suggestion in enuresis of nervous origin 302
Hypnotics in chronic nephritis 616
– for insomnia 495
– in mental disease 573, 578
– neurasthenia 634
– neuritis 637, 638
– pneumonia 687
– puerperal sepsis 726
HYPNOTISM 478
– in alcoholism and drug habits 481
– hysteria 480, 485
– impotence of psychical origin 481
– insanity 481
– method of induction .. 478
– – terminating 480
– in neurasthenia 481
– obsessions 482
– self-hypnosis and self-suggestion 479
– so-called dangers of .. 482
– susceptibility to 480
– therapeutic value of suggestion 480
– in vicious and degenerate children 482
Hypochylia, typical prescriptions for 252
Hypodermic injection of diphtheritic serum—technique 226
– – saline in infantile diarrhœa—technique .. 223
Hypopharyngeal tumours .. 592
Hypopharyngoscopy, method of 338
Hypopyon ulcer of cornea .. 193
Hysterectomy in puerperal sepsis 723
HYSTERIA 483
– electricity in .. 287, 485
– hypnotism in 480
– mental and physical examination in 484
– psycho-analysis in .. 486
– relation to neurasthenia 483, 634
– suggestion in 485
– Weir-Mitchell treatment in 485
Hysterical paraplegia .. 667
– paralysis supervening on hemiplegia 458
– patients, palpitation in .. 662
– vomiting 973

ICHTHYOSIS 487
– of tongue 928
Idiocy (*see* Mental Deficiency in Children)
Idiopathic dilatation of colon (*see* Congenital Dilatation)
Ileocolostomy, indications in obstruction 499
Ileosigmoidostomy for chronic constipation 189
Iliac arteries, aneurysms of 52
Imbecility (*see* Mental Deficiency in Children)
Immunity, passive and active 833
– Schick's test in diphtheria outbreaks 232

PAGE

Immunization (*see* Specific Therapy)
IMPETIGO CONTAGIOSA .. 488
IMPOTENCE 488
– hypnotism in 481
– nervous or psychical .. 488
– organic 488
– sterility due to 879
– symptomatic 488
Incompatibility in prescribing 700
Incontinence of urine (*see also* Enuresis) 300
– – faradization in 287
– – in tabes 898
Indigestion (*see* Dyspepsia)
– intestinal (*see* Colic; Diarrhœa; Flatulence)
– toxæmia, headache due to 438
INFANT FEEDING 489
– – artificial 490
– – breast 489
– – common substitute foods 493
– – relation to dental disease 493
– – signs of milk intolerance 492
– – weaning 490
Infantile convulsions (*see* Convulsions, Infantile)
– diarrhœa (*see* Diarrhœa, Infantile)
– hydrocele 468
– paralysis (*see also* Poliomyelitis) 695
– – faradization in 286
– – massage in 554
– scurvy 818
– wasting (*see* Marasmus)
Infants, acute arthritis of .. 100
– constipation in 183
– inguinal hernia in .. 464
Infection, dangers in operation on mouth and pharynx 587
– persistent, in amputation stumps 885
– of uterus or vagina, ionization in 280
Infiltration anæsthesia .. 43
Inflammation of bursæ .. 130
– ear (*see* Ear)
– gall-bladder 152
– rectum and colon, ionization in 280
INFLUENZA 494
– as a cause of baldness .. 429
– inoculation against .. 840
Inguinal aneurysms 52
– hernia 462
Inhalations for bronchiectasis 119
– laryngitis—method .. 530
Injection methods with sera and vaccines .. 836, 837
– – in neuralgia 629
– in syphilis 890
– of sera, intraventricular, in meningitis 560
– treatment in tuberculous joints 514
Innominate artery, aneurysm of 51
Insanity (*see* Mental Diseases)
Insemination, artificial .. 880
INSOMNIA 494
– in chronic bronchitis .. 123
– – nephritis 615
– of drug habit 243
– faradization in 287
– in gout 405
– hydrotherapy in 470
– list of hypnotics 495
– massage in 554
– of myocardial failure .. 599
– in neurasthenia 633
– neuritis 637, 638

PAGE

Insomnia in pneumonia .. 687
– premonitory of mental disease 571
– in pulmonary tuberculosis 743
– senile 495, 497
– toxic 497
Institution treatment of mental deficients 565
Insufflation of orthoform in laryngeal phthisis, Leduc's tube for 536
Integration in relation to mental disease 566
Intercostal artery, hæmorrhage from 989
Intermittent claudication .. 198
Interstitial keratitis .. 195
Intestinal catarrh, chronic 218, 219
– crises of tabes 899
– derangements in mental disease 577
– flatulence 332
INTESTINAL OBSTRUCTION .. 497
– – as a complication of acute appendicitis .. 76
– – from malignant growth 499
– – volvulus 498
INTESTINAL STASIS 499
– – surgical treatment of .. 188
– wounds (*see* Abdominal Injuries; Gunshot Wounds)
– worms 980
Intestine, carcinoma of, radium treatment 761
Intracranial hæmorrhage (*see* Hæmorrhage, Intracranial)
INTRACRANIAL TUMOURS .. 499
Intra-ocular hæmorrhages .. 315
Intubation, advantages and disadvantages 527
– technique of 229
– – removal of the tube .. 231
INTUSSUSCEPTION 500
Inversion of uterus, chronic 965
Inward convulsions 190
Iodide of potassium in granular kidney 614
– – myocardial failure .. 599
Iodides in syphilis 893, 895
– tabes dorsalis 895
Iodine poisoning 693
Iodoform injections in tuberculous joints 514
– poisoning 693
Ionization (*see* Electrotherapeutics)
Ipecacuanha in hæmoptysis 419
– treatment of dysentery .. 246
Iridectomy in cataract 145, 146
– glaucoma 383
Iridocyclitis 501
– associated with interstitial keratitis 195
– and cataract 145, 146, 148
Iridodialysis 315
Iris, prolapse and entanglements of 318
IRITIS 501
– after cataract extraction .. 148
– atropine and its substitutes 503
– chronic iridocyclitis .. 502
– diagnosis from glaucoma 381
– due to oral sepsis 502
– glaucoma complicating .. 383
– gonococcus vaccine in .. 849
– gonorrhœal 399, 501
– local treatment 503
– lymph in pupillary area from 501
– metastatic 502
– operative treatment .. 503
– rheumatic and gouty .. 502

PAGE

Iritis, synechia and glaucoma with 501, 504
– syphilitic 501
– tuberculous 502
Iron in chlorosis .. 25, 26, 27
– waters in chlorosis .. 27
Iron-aperient combinations in treatment of chlorosis .. 25
Irrigation treatment of gonorrhœal prostatocystitis .. 204
Irritation, cerebral 111
Ischæmic paralysis, Volkmann's 969
Ischiorectal abscess 8
Itch 808

JACKETS and supports in scoliosis 817
JAUNDICE 504
– catarrhal (*see* Bile-ducts, Catarrh of)
Jaw, bony ankylosis of .. 63
– dislocations of 232
JAW, DEFORMITIES OF .. 504
JAW, FRACTURES OF .. 504
– – from necrosis 506
JAW, NECROSIS OF 506
– – from alveolar abscess .. 507
– – chemicals 508
– – compound fracture .. 506
– – pyæmia 508
– – syphilis, tubercle, and actinomycosis .. 508
JAW, TUMOURS OF 508
– – antrum of Highmore .. 51
– – dental tissue 51
– – the mucoperiosteum .. 508
– – the palate 510
Jejunostomy and gastrostomy in cancer 88
Jephson's powder for habitual constipation 18
Joint resection in poliomyelitis and encephalitis .. 69
Joints, ankylosis of (*see* Ankylosis)
– gouty, local treatment of 40
– gunshot wounds of (*see* Gunshot Wounds)
– sprains of 86
JOINTS, TUBERCULOUS DISEASE OF 51
– – – age factor in 51
– – – artificial hyperæmia in 51
– – – Bier's hyperæmic treatment 9
– – – hygiene and diet in .. 51
– – – injection treatment .. 51
– – – operative treatment.. 51
– – – rest treatment .. 51
– – – pressure treatment .. 51
– – – principles of treatment 51
– – – social conditions influencing 51
– – – stage indicating operation 51
– – – treatment of individual joints 51
– – – tuberculin treatment 513, 85
Jugular and carotid vessels, arteriovenous aneurysm of 5

KALA-AZAR 51
KELOID 51
– Bier's hyperæmia in 93, 51
– electricity in 51
– radium treatment .. 70
Keratitis (*see also* Cornea, Diseases of)

PAGE

Keratitis, interstitial .. 195
– phlyctenular .. 194, 195
– punctata with chronic iridocyclitis 502
– purulent, ionization in .. 280
Keratocele 194
Keratosis obturans 256
Kidney calculus (*see* Calculus, Renal)
– disease, dropsy in (*see* Dropsy, Renal)
– – rheumatic 779
– granular (*see* Granular Kidney)
– gunshot wounds of .. 414
– hæmorrhage from 415, 416
– inflammation of (*see* Nephritis; Pyelitis; Pyelonephritis)
– injuries of 5
KIDNEY, MOVABLE 519
– – hydronephrosis due to .. 469
– surgical 745
Kimpton's method of blood transfusion 937
Klapp's suction balls in tuberculous joints .. 514
Knee, housemaid's 130
– parson's 131
Knee-joint, affections of bursæ around 131
– amputation stump .. 884
– bony ankylosis of 63
– cages for internal derangements 520
– dislocations of 238
– fractures into 367
– hypertrophied synovial fringes 522
– injuries of tendons of 912, 913
KNEE, INTERNAL DERANGEMENT OF 520
– loose bodies in 521
– ruptured crucial ligaments 522
– synovitis in 888
– torn or displaced cartilages 520
– tuberculous disease of .. 517
KNOCK-KNEE 521
– operative treatment .. 523
– splint treatment 523
Koch's tuberculins 736
Kocher's method in dislocation of shoulder 234
– operation in inguinal hernia 463
KRAUROSIS VULVÆ 524
Krull's irrigations for acute catarrhal cholangitis .. 95

LABOUR, eclampsia in .. 271
Laburnum poisoning .. 693
Labyrinth, affections of (*see* Ear)
Laceration of brain 111
LACHRYMAL APPARATUS, DISEASES OF 524
– gland, acute inflammation of 524
– obstruction, congenital .. 527
– sac, excision of 526
– – fistula of 527
Lachrymation and epiphora 524
Lactalbumin in infant feeding 493
Lamellar cataract 144
Lane's operation for cleft palate 160
Langenbeck's operation for cleft palate 162
Laryngeal complications in small-pox 828
– crises of tabes 899
– diphtheria 229

PAGE

LARYNGEAL OBSTRUCTION .. 527
– – from diphtheria .. 527
– – intubation or tracheotomy 527
– – from œdema of glottis .. 528
– – simple laryngitis .. 528
– – – new growth and foreign bodies 529
– – syphilis 529
– – tracheotomy in — technique 528
– part of pharynx, cancer of 591
– spasm, catarrhal (croup) .. 199
LARYNGEAL STRIDOR (Congenital) 529
LARYNGISMUS IN CHILDHOOD (Laryngismus Stridulus) 529
LARYNGITIS 530
– acute 530
– – œdematous 531
– catarrhal (croup) 199
– chorditis tuberosa 532
– chronic catarrhal 531
– compress for 476
– hypertrophic and atrophic 532
– inoculation against .. 849
– with measles 556
– method of inhalation .. 530
– subglottic 532
Laryngoscopy, direct method of 338
Larynx, foreign bodies in (*see* Foreign Bodies)
LARYNX, MALIGNANT DISEASE OF 532
– – – extrinsic growths .. 534
– – – intrinsic growths .. 532
– – – palliative measures .. 534
– – – thyrotomy in 533
– – – total extirpation of larynx in 532
LARYNX, TUBERCULOSIS OF .. 535
– – relief of pain, dysphagia, and dyspnœa .. 536
– – removal of epiglottis in 535
Laxatives for chronic constipation 186
– constipation in children .. 184
– mental disease 577
Lead, deafness due to .. 266
– poisoning 684, 693
– – neuritis due to 636
Lead-workers, double electric baths for 685
Leduc's tube for orthoform insufflation 536
Leeching in iridocyclitis .. 503
Leg, amputation stumps .. 884
– aneurysm of 51
– fractures (*see* Fractures)
Leiter's coil in fevers .. 327
Lens, dislocation of 315
– – congenital 536
– – glaucoma due to .. 384
– wounds of 318
LEPROSY 536
Leucocytes, effect of *x* rays on 538
Leucodescent lamp, use in phototherapy 679
Leucoplakia 928
– as cause of pruritus vulvæ 711
LEUCORRHŒA 537
LEUKÆMIA 537
– radium treatment 766
– *x* rays in 756
Leukæmia 861
LICHEN PLANUS 539
– urticatus 963
Lichenification of skin, radium treatment 766
Lienteric diarrhœa .. 218, 220
– – of infants 222

PAGE

Ligaments, cruciate, rupture of 521
Ligature of artery of supply in aneurysm 48
– operation for internal piles 427
Light treatment (*see* Photo-therapy)
Lightning pains of tabes .. 897
Lime poisoning 693
Limitations of treatment .. 4
Lindemann's method of blood transfusion 938
Lingual nerve, injuries of .. 897
Lips, epithelioma of 590
– herpes of 466
Lithodapaxy 132
Lithotomy 131
Little's disease 663
Liver, abscess of 462
– cirrhosis of (*see* Cirrhosis of Liver)
– gunshot wounds of .. 414
LIVER, HYDATID DISEASE OF 539
– inadequacy in gout .. 405
LIVER, INJURIES OF .. 5, 540
Lobelia poisoning 693
Local anæsthesia or analgesia 43
Locomotor ataxia (*see* Tabes Dorsalis)
Loose bodies in knee .. 521
– – with sprains .. 866, 868
Loreta's operation for congenital pyloric hypertrophy 173
Ludwig's angina 57
LUMBAGO 540
– gouty cases 540
– high-frequency current in 289
– from local fibrositis .. 541
– massage in 555
– phototherapy in 680
– static electricity in .. 292
– traumatic 541
LUMBAR PUNCTURE 542
– – in apoplexy 71
– – cerebrospinal meningitis, method 559
– – headache 441
– – hydrocephalus 469
– – intracranial tumour .. 560
Luminal as hypnotic .. 496
Lungs, œdema of (*see* Congestion, Pulmonary)
LUPUS ERYTHEMATOSUS .. 542
– – carbonic acid snow in 141, 543
– – radium treatment .. 766
LUPUS VULGARIS 543
– – of auricle 255
– – Bier's hyperæmic treatment in 93
– – carbonic acid snow for .. 141
– – climatic treatment .. 649
– – electricity in 545
– – Finsen light in 680
– – of nose 649
– – radium and uranium in 547, 765
– – tuberculin treatment in 547, 649
– – *x* rays in 546, 765
LYMPHADENOMA (*see also* Tuberculous Glands, 944) 547
Lymphangioma of tongue .. 940
Lymphangitis, Bier's hyperæmic treatment in .. 92
– gonorrhœal 397
Lymphatic leukæmia .. 537
– – radium treatment .. 766
– œdema of arm in cancer of breast 117
Lymphosarcoma 548
– of mouth and pharynx .. 586

PAGE

McBRIDE'S treatment of chronic alcoholism .. 21
Macewen's operation for thoracic aneurysm 54
– osteotomy for knock-knee 523
– triangle, view of temporal bone showing 263
Macroglossia 930
MALARIA 548
– adjuvant drugs 550
– intolerance of quinine .. 550
– methods of giving quinine 549
Malformations of auricle .. 255
– sterility due to .. 878, 879
Malignant disease, diathermy in 291
– – intestinal obstruction due to 489
– – of jaw 509
– – larynx 532
– – lymph-glands 548
– – mouth and pharynx .. 585
– – nerves 638
– – nose 651
– – œsophagus 657
– – parotid gland 808
– – prostate 705
– – radium treatment of .. 760
– – of thyroid 389
– – *x* rays in 756
– œdema 375
Mallet finger 912
Malta fever 951
MAMMARY ABSCESS 550
– – persistent sinuses with 551
– neuralgia 111
Mandible (*see* Jaw)
Maniacal symptoms in eclampsia 273
Manipulation treatment of aneurysm 45
MARASMUS 551
Marriage of deaf-mutes .. 266
– epileptics 307
MASSAGE 552
– affections to be used in, and methods 554
– in chronic gout 403
– – rheumatism 782
– dilatation of stomach .. 881
– fractures 349
– – objects and methods .. 351
– friction, vibration, and general 553
– for habitual constipation 186, 188
– in headache .. 436, 440
– hemiplegia 459
– mental disease 576
– neuralgia 630
– neuritis 637
– poliomyelitis and encephalitis 696
– rheumatoid arthritis .. 788
– sciatica 815
– sprains 863
– of stomach and abdomen 554
– in synovitis 888
– tabes dorsalis 897
– technique 552
Mass-reflex (Head and Riddoch) significance in paraplegia 669
MASTITIS, Acute and Chronic .. 555
– Bier's hyperæmic treatment in 93
– indications for operation .. 556
– prophylactic treatment (*see also* Nipple, 640) .. 555
– *x* rays in 112
Mastoid operation, indications and technique 262

PAGE

Matas' operation for aneurysm 48
Maxilla (*see* Jaw)
MEASLES 556
– diarrhœa in 557
– diphtheria complicating .. 557
– laryngitis in 556
– quarantine in 328
Meatal stricture 958
Mechanotherapeutics in hemiplegia 459
– for sprains 869
Medicinal treatment 3
Medinal in insomnia 496
Mediterranean fever 951
Megrim (*see* Headache ; Migraine)
Meibomian cyst 319
– – specific therapy in .. 847
Melæna in cirrhosis of liver .. 158
– due to crack on tongue .. 988
– or hæmatemesis as a complication of acute appendicitis 76
– neonatorum 425
Membrane, artificial, in otitis media 265
Membranous colitis .. 166, 167
– conjunctivitis 180
Ménière's disease .. 267, 968
– – seton treatment .. 823
MENINGITIS 558
– acute infective or purulent 558
– cerebrospinal, inflammation of labyrinth in 267
– – specific therapy in .. 847
– epidemic cerebrospinal .. 558
– – – intraventricular injection in 560
– – – method of lumbar puncture 559
– – – serum therapy in .. 559
– posterior basic 561
– syphilitic and tuberculous 560
Meningocele (*see* Spina Bifida) 852
MENOPAUSE 561
– hydatid mole at the .. 563
– palpitation at the 662
– unusual bleeding at the 562, 563
MENORRHAGIA AND METRORRHAGIA 562
– – – radium treatment .. 765
– as a symptom of cancer .. 562
Menses, retention of (*see* Amenorrhœa) 22
Mental causes of headache .. 439
MENTAL DEFICIENCY IN CHILDREN 563
MENTAL DISEASES 566
– – causation and prophylaxis 569
– – causative relation of nervous constitution .. 569
– – – – of traumata .. 570
– – fear of, in neurasthenia 634
– – heart weakness in .. 577
– – heredity and 570
– – home or hospital treatment ? 574
– – hydrotherapy in .. 470
– – hypnotics and sedatives in 573, 578
– – hypnotism in .. 481, 573
– – intestinal derangements in 577
– – massage, hydrotherapy, and electrotherapy in 576
– – medicinal treatment 573, 577
– – nursing and feeding in .. 575
– – occupation and amusements in .. 571, 577
– – premonitory and early symptoms 571

PAGE

Mental diseases, psychotherapy 57
– – recent developments in psychology—conscious v. unconscious mind 56
– – – – energy 56
– – – – integration .. 56
– – – – mentation .. 56
– – – – psycho-analysis .. 56
– – regulations as to voluntary and certificated patients in hospitals .. 57
– – rest and exercise 571, 57
– fatigue, galvanism in .. 28
– hospitals, hints on certification 57
– and moral atmosphere in treatment of cancer .. 13
– rest in treatment of cancer 13
– therapeutics in valvular disease 45
Mentation, relation to mental disease 56
Mercury in hæmoptysis .. 41
– necrosis of jaw caused by 50
– salts, poisoning by (*see* Corrosive Sublimate) .. 69
– treatment of syphilis .. 89
– – – of nervous system .. 89
– – tabes 89
Metacarpal bones, fractures of 36
Metatarsal bones, fractures of 37
METATARSALGIA 58
Meteorism 33
Metritis, chronic, radium treatment 76
Metrorrhagia (*see also* Menorrhagia) 56
– as a symptom of cancer .. 56
Micturition, precipitate .. 30
MIGRAINE 438, 58
– seton treatment .. 584, 82
Migrainous gastric neurosis .. 97
Milk in infant feeding .. 49
– intolerance, signs of .. 49
Mind, recent developments concerning the 56
Miner's elbow 13
Mineral water baths 47
– waters in gout 40
Moles, carbonic acid snow for 14
– electrolysis for 28
MOLLUSCUM CONTAGIOSUM .. 58
Monocular cataract .. 145, 14
Mooren's ulcer, ionization in 28
Moral training of mentally deficient children .. 56
Morphine poisoning (Opium) 69
– treatment of eclampsia .. 27
Morphinomania (*see also* Drug Habit) 24
Morton's disease 58
MOSQUITO BITES 58
Mosquitoes and yellow fever 99
Mother's friend, poisoning by (Opium) 69
Motor aphasia 6
Mouth affection of sprue .. 87
– cancer of, cleanliness in treatment of 13
– disinfection of, before operations in mouth 58
– inflammations of 88
– operations, anæsthesia in 3
MOUTH AND PHARYNX, MALIGNANT DISEASE OF .. 58
– – – – dangers of the operation 58
– – – – operations on special regions 59
– – – – operative treatment 58
– – – – radium treatment .. 76

PAGE

Mouth and pharynx, malignant disease of, sarcoma 586
– – – – squamous epithelioma 585
– – – – treatment of inoperable cases .. 589
– septic conditions in .. 659
– sores about, with whooping-cough 980
– and throat, burns and scalds of 129
– washes in fevers 328
– – for sprue 870
Movable kidney 519
Movement and massage in fractures 349
– – neuritis 637
– – poliomyelitis 696
– passive and resisted, in cerebral palsies of childhood 663
– – in hemiplegia 458
– re-education of, in hemiplegia 460
– in sprains 863
– synovitis 888
Mucocele complicating spreading corneal ulcer .. 193
– of lachrymal sac complicating cataract 147
Mucous colitis .. 166, 167
– disease in children.. .. 253
– polypus of cervix uteri .. 562
Mules' operation in blind eyes with staphylomatous cornea 194
Multiple cystic disease of breast 113
MUMPS 592
– orchitis with 592
Muriatic acid, poisoning by (*see* Acid, Hydrochloric) 693
Muscarin poisoning (*see* Fungi) 693
Muscles, hernia in 867
– rupture of 867
– sprains of 867
Muscular atrophy, progressive, massage in 555
– relaxation in anæsthesia .. 40
– rheumatism (*see* Rheumatism, Chronic)
Musculospiral nerve, injuries of 624
Mushroom poisoning (*see* Fungi) 693
Mussel poisoning 693
Mustard baths, hot, for bronchopneumonia in children 126
Myalgia (*see* Rheumatism, Chronic)
– massage in 555
MYASTHENIA GRAVIS .. 592
MYCOSIS FUNGOIDES 593
Myelitis, paraplegia with .. 668
Myeloid leukæmia 537
Myelomata 106
– of jaw 509, 510
MYOCARDIAL FAILURE .. 593
– – in bronchitis .. 121, 124
– – chlorosis with 600
– – diet in 595
– – in diphtheria .. 227, 228
– – drug treatment 596
– – insomnia in 599
– – pulmonary œdema with 599
– – rest and exercise in .. 593
Myoma, uterine, *x* rays in .. 756
Myositis, ossifying, after sprains 868
MYXŒDEMA 600
Myxomata of antrum of Highmore 511

PAGE

NÆVI (*see* Angeiomata)
NAILS, DISEASES OF .. 601
– – eczema 601
– – psoriasis and hypertrophy 601
– – ringworm and favus .. 601
Narcotics in thoracic aneurysm 55
Nasal catarrh (*see* Rhinitis)
– disease, headache due to .. 437
– obstruction due to adenoids 13
– sinusitis a cause of septic anæmia 28
– stones 646
– treatment of hay fever .. 434
Nasopharyngeal catarrh (*see* Post-nasal Catarrh)
Nasopharyngitis (*see* Rhinitis, Acute; Pharyngitis)
Nasopharynx, fibromata of, diathermy in 292
Nativelle's digitalin granules 597
Nauheim bath 472
– – in disorders of the circulatory system .. 445
– – valvular disease .. 451, 452
Neck, aneurysms of 51
– and head, septic conditions of, Bier's hyperæmic treatment in 92
Necrosis of bones .. 100, 103
Needle-holder for electrolysis 283
Needling for cataract 145, 148
– of sac in aneurysm .. 45
Negro-lethargy 944
Nepenthe poisoning (Opium) 693
Nephrectomy for stone .. 135
NEPHRITIS, ACUTE 602
– – diet in 602
– – production of sweating in 604
– – purgatives in 603
– – renal extracts in .. 605
– – saline transfusion in .. 605
– – treatment in convalescence 605
– – venesection in 604
NEPHRITIS, CHRONIC (*see also* Granular Kidney) .. 606
– – dropsy in 240
– – heart failure of 598, 599
– – parenchymatous .. 606
– – – diet in 606
– – – drugs in 607
– – – importance of fresh air in 607
– with diabetes 217
Nephrolithotomy 135
Nerve anastomosis .. 618, 622
– crossing 618
– injuries, after-treatment of 621
– – brachial plexus 624
– – cervical sympathetic .. 628
– – circumflex nerve .. 624
– – complicating sprains .. 865
– – complications during recovery after complete division .. 618, 620
– – external cutaneous .. 626
– – facial 626
– – with fractures and dislocations 620
– – hyperalgesia in 620
– – lingual 626
– – long thoracic (Bell) .. 624
– – musculospiral 624
– – neurotomy and neurectomy 622
– – prognosis of 621
– – sciatic 625
– – spinal accessory.. .. 628
– – subcutaneous 619
– – ulnar 623
– resection in poliomyelitis and encephalitis .. 696

PAGE

Nerve roots, posterior, division of 622
– – – – in cerebral palsies of childhood .. 663
– – section in cerebral palsies of childhood 664
– – symptoms due to cervical rib 624
– transplantation 618
– troubles in amputation stumps 885
Nerves and nerve-roots, division of for pain in cancer 138
NERVES, PERIPHERAL, SURGERY OF 616
– – – special methods of treatment 621
– pressure of centre on .. 389
– suture of 616
– – secondary 617
Nervous asthma, spa treatment in 444
– constitution, relation to mental breakdown .. 569
– diarrhœa 218, 220
– diseases, intimate alliance with mental 560
– flatulence 332
– patients, palpitation in .. 661
– tinnitus in 268
– retention of urine.. .. 303
– symptoms, prodromata of mental disease 571
– system, syphilis of .. 894
NEURALGIA 628
– Bier's hyperæmic treatment in 94, 95
– brachial 629
– of breast 111
– in diabetes 217
– electricity in .. 281, 629
– epileptiform 631
– following herpes zoster .. 465
– general treatment 630
– hypodermic injections in 629
– local treatment 629
– major 629, 631
– massage in .. 555, 630
– phototherapy in 680
– seton treatment 823
– *x* rays in 756
Neuralgic headache .. 436, 441
NEURASTHENIA 632
– diet in 633
– drug treatment 635
– electricity in .. 282, 292
– fear of insanity in .. 634
– gastroptosis with 329
– hay fever due to 434
– hypnotism in 481
– from internal-ear affections 267
– irritable heart muscle of .. 447
– massage in 555
– movable kidney with .. 519
– occupational treatment .. 635
– psycho analysis in .. 634
– psychotherapy in 633
– re-education in management of life 633
– relation to hysteria 483, 634
– rest cure in 632
– sexual 488
– traumatic, baths in .. 471
– Weir-Mitchell treatment .. 632
Neurasthenic dyspepsia .. 633
– insomnia 633
– vertigo 968
Neurectomy 621
NEURITIS 636
– brachial, high-frequency current in 289
– diathermy in 290

PAGE

Neuritis, diet in 637
– electricity in 281, 292, 637
– massage in .. 555, 637
– optic 659
– peripheral, ionization in .. 281
– phototherapy in 680
NEUROMATA 638
– diffuse, operation followed by increase 639
Neuropathic ulcer of cornea 194
Neurotomy 621
Newly-born, convulsions in 190
hæmorrhagic disease of .. 425
Nicotine, deafness due to .. 266
– poisoning 693
NIGHTMARE 640
NIGHT TERRORS 639
NIPPLE, DISEASES OF THE .. 640
– – cracks, fissures, eczema 640
– Paget's disease of .. 640
– – – radium treatment .. 762
Nitric acid, poisoning by .. 691
Nitrites in beri-beri 90
Nitrobenzene or nitrobenzol poisoning 693
Nitroglycerin poisoning .. 693
Nitrous oxide, administration of 35
– – poisoning 693
Nocturnal cramp 198
Noma (*see* Stomatitis)
Nose, abnormalities of (*see* Septum Nasi)
– abscess in 822
NOSE, ACCESSORY SINUSES OF (*see also under various sinuses*) 641
– – – acute suppuration .. 641
– – – complications in atrophic rhinitis 795
– – – conditions causing headache 437
– – – suppuration in antrum 641, 642
– – – – ethmoidal cells 642, 645
– – – – frontal sinus 642, 643
– – – – sphenoidal sinus 642, 645
– bleeding from (*see also* Epistaxis) 988
NOSE, FOREIGN BODIES IN .. 646
NOSE, FRACTURES OF 646
– hypertrophy of 802
NOSE, PERFORATING ULCER OF SEPTUM OF 645
NOSE, POLYPUS OF 647
NOSE, REDNESS OF 648
– – *x* rays in 755
– sores about, with whooping-cough 980
NOSE, SYPHILIS OF 648
NOSE, TUBERCULOSIS OF (Lupus) 649
NOSE, TUMOURS OF 650
– – *x* rays and radium in .. 651
Nursing in acute rheumatism 771, 775
– mental disease 575
– of paraplegic cases .. 669
– in puerperal infection .. 726
– spinal fractures 859
– tetanus 917
Nutrient enema in valvular disease 452, 455
Nux vomica poisoning (*see* Strychnine) 694
NYSTAGMUS AND HEAD-NODDING 651

OBESITY 652
– dietetic treatment .. 652
– drug treatment 654
– with emphysema 293
– exercise in 654
– faradization (Bergonié) in 287, 654

PAGE

Obesity, sterility due to .. 880
Obsessions, hypnotism in .. 482
Obstruction of canaliculus, epiphora due to .. 525
– chronic intestinal, surgical treatment of constipation due to 188
– intestinal (*see* Intestinal Obstruction)
Obstructive constipation 188, 189
Occupational deafness .. 267
– treatment in mental disease 577
– – neurasthenia 635
Odontomes 511
Œdema of glottis 528
– malignant 325
– pulmonary (*see* Congestion, Pulmonary, and Œdema)
– – in myocardial failure .. 599
– rheumatic pulmonary .. 778
– following septic infantile diarrhœa 224
Œdematous laryngitis .. 531
Oertel treatment in valvular disease 451, 452
Œsophageal catarrh, chronic 655
– pouches 657
Œsophagitis, acute 655
Œsophagoscopy, contra-indications and dangers .. 344
– method of 341
Œsophagus, cancer of, treatment by rest 136
– foreign bodies in 332
– hæmorrhage in 655
– malignant disease of .. 656
– pressure of goitre on .. 389
– stricture of, spastic and cicatricial 656
ŒSOPHAGUS, SURGICAL DISEASES OF 654
– syphilis of 655
– tuberculosis of 655
– ulceration and fissures of 655
Offensive breath 117
Olecranon, fractures of .. 360
Onychauxis 601
Onychia 601
Onychogryphosis 601
Oöphorectomy for irremovable cancer of breast .. 116
– in puerperal sepsis .. 723
Open-air treatment in mental disease 572
– – pulmonary tuberculosis 728
– – tuberculous osteitis .. 104
Operative treatment .. 4
Ophthalmia, gonorrhœal .. 399
– neonatorum (*see also* Conjunctivitis, Gonorrhœal) 178
OPHTHALMIA, SYMPATHETIC .. 658
Optic atrophy in tabes .. 899
OPTIC NEURITIS 659
Opium in acute bronchitis 120, 121, 124
– for chilblains 151
– in cœliac disease 163
– colitis 166
– granular kidney 615
– hæmoptysis 419
– mental disease 579
– poisoning 694
ORAL SEPSIS 659
– – a cause of septic anæmia 28
– – iritis due to 502
– – before operations in mouth 588
– – in sprue 870
ORBITAL CELLULITIS 660
Orchidopexy for ectopia and imperfect descent .. 916

PAGE

ORCHITIS (*see also* Epididymitis, 303; Gonorrhœa, 398) 660
– gonococcal, diathermy in 290
– with mumps 592
Organotherapy in mental disease 577
Oriental sore 206
Orthoform insufflation in laryngeal phthisis, Leduc's tube for 536
Orthopnœa of myocardial failure 594, 599
Orthostatic albuminuria .. 18
Ossicles, caries of 264
Ossifying myositis after sprains 868
Osteitis, Bier's hyperæmic treatment in 95
– tuberculous (*see* Bone, Tuberculous Disease of)
Osteo-arthritis (*see* Rheumatoid Arthritis)
– after sprains 868
OSTEOMALACIA 661
Osteomata (*see* Bone Tumours)
– of jaw 510
– nose 650
Osteomyelitis (*see* Bone, Inflammations of)
– Bier's hyperæmic treatment in 92
– specific therapy in .. 848
– vaccines in .. 101, 103
Osteotomy for knock-knee 523
Otitis media (*see* Ear, Affections of)
Otomycosis 255
Ovaritis 808
Oxalic acid, poisoning by .. 691
OXALURIA 661
Oxygen inhalations in pneumonia, how to use .. 688
– – pulmonary congestion and œdema 175
– – uræmia 982
– – valvular heart disease .. 454
Ozæna 794

PACKS, the drip sheet .. 473
– local 476
– wet 475
– – in fevers 326
Paget's disease of the nipple 640
– – radium treatment .. 762
Pain in cancer, relief of .. 138
– high-frequency current for relief of 289
– in phthisis, relief of .. 741
– relation to dyspepsia .. 250
Palate, cleft (*see* Cleft Palate)
– lupus of, radium treatment 765
– tumours of 510
Palmar fascia, Dupuytren's contracture of 245
– and plantar abscesses .. 9
– – – – hæmorrhage from 987
– vessels, aneurysm of .. 50
PALPITATION 661
– with tachycardia 900
PALSIES, CEREBRAL, OF CHILDHOOD 663
– – – massage in 554
– craft 198
Palsy, birth 97
PANCREAS, DISEASES OF .. 664
– tumours of 664
Pancreatic calculi and cysts 664
– diarrhœa 218, 219
– extracts in diabetes .. 216
Pancreatitis, acute and chronic 664
Pannus as a complication of trachoma .. 181, 182

PAGE

Pannus, phlyctenular .. 195
Papillomata (*see also* Warts)
– anal 65
– of auricle 255
– of bladder, diathermy in .. 291
– conjunctiva 183
– external auditory meatus 258
– jaw 509, 510
– laryngeal obstruction by .. 529
– of nose 650
– skin, diathermy in .. 292
– – electrolysis for 284
– tongue 931
Paracentesis in anasarca .. 242
– cardiac dropsy 455
– cirrhotic ascites 158
– empyema 293
– hypopyon ulcer 198
– pleurisy 682
– pneumothorax 690
Paraffin oil, poisoning by .. 694
– treatment of burns .. 128
Paraldehyde as hypnotic .. 496
– for insomnia in bronchitis 121, 124
– in mental disease 578
– poisoning (*see* Chloral) .. 694
PARALYSIS AGITANS 665
– – diathermy in 291
– – massage in 555
– atrophic, massage in .. 555
– birth 97
– in diphtheria 228
– Erb-Duchenne (birth) .. 97
– facial 322, 626
– – from middle-ear disease 265
– – nerve anastomosis in 322, 626
– – with otitis media .. 626
– faradization in 285
– functional or hysterical, supervening on hemiplegia 458
– hysterical, faradization in 287
– infantile, faradization in 286
– from lead poisoning .. 684
– of sphincter iridis or ciliary muscle 315
– after sprains 868
– Volkmann's ischæmic .. 969
Paralytic ectropion 321
– ptosis of eyelid 320
– squint 870
– talipes equinus 902
– (*see also* Palsies) .. ..
PARAPHIMOSIS 666
PARAPLEGIA (*see also* Neuritis; Palsies of Childhood; Poliomyelitis) 666
– of acute onset, precautions in 669
– congenital 670
– – spastic 663
– flaccid 670
– with hæmorrhage and acute myelitis 668
– hysterical 667
– significance of the 'mass-reflex' 669
– with spinal caries 668, 857
– syphilitic 667
– traumatic 668
Paratyphoid fever (*see* Enteric Fever)
Paresis after sprains .. 868
Paronychia (*see* Whitlow) .. 976
PAROSMIA 670
Parotid gland, wounds of .. 808
– tumours 807
– – radium treatment .. 765
Parotitis, epidemic (mumps) 592
– primary 803
– secondary 804

PAGE

Paroxysmal rhinorrhœa (*see* Hay Fever)
Parson's knee 131
Passive and active immunity 823
Pasteur treatment of rabies 748
Patella, dislocations of .. 238
– – unreduced, due to genu valgum 238
– fractures of 368
Patellar ligaments, injuries of 912, 913
Paul's operation for thoracic aneurysm 55
Pavor nocturnus 639
Peat baths 473
PEDICULOSIS (Capitis, Corporis, Pubis) 671
– as a cause of headache .. 436
PELLAGRA 671
Pelvic conditions, spa treatment of 446
– drainage in puerperal sepsis 722
– inflammation, sterility due to 879
Pelvis, fractures of 363
PEMPHIGUS 671
Peptone treatment of hæmophilia 418
Peptonized milk in infant feeding 493
Perforating ulcers 950
– – of cornea 194
– – septum nasi 645
Perforation in enteric fever 298
Pericarditis (*see* Rheumatism, Acute)
Perichondritis of auricle .. 255
Pericolitis (*see* Diverticulitis of Colon)
Periodontitis 910
Periostitis (*see* Bone, Inflammations of)
– tuberculous, *x* rays in .. 756
Peripheral bony ankylosis .. 60
– nerves, surgical diseases and injuries of (*see* Nerves)
– neuritis (*see* Neuritis; Paraplegia)
Peritonitis, abdominal compress in 476
PERITONITIS, TUBERCULOUS .. 672
– tuberculin treatment .. 851
Peritonsillar abscess .. 9
Peri-urethral abscess, gonorrhœal 397
Pernicious anæmia .. 23, 29
– – antiseptic treatment .. 31
– – arsenic in 30
– – blood transfusion in 33, 937
– – bone-marrow in .. 31
– – general considerations 29
– – management and diet 29
– – medicinal treatment .. 30
– – serum treatment .. 32
– – splenectomy in .. 33
Perspiration, excessive .. 478
– – *x* rays in 756
– night, in pulmonary tuberculosis 743
PERSPIRATION, OFFENSIVE .. 673
Pertussis (*see* Whooping-cough)
Pes cavus 904
Pétrissage, method of .. 552
Petroleum poisoning .. 694
Phagedæna in syphilis .. 889
Phagedænic ulcer 951
PHARYNGITIS 673
– acute catarrhal or simple 673
– compress for 476
– granular 674
– inoculation against .. 840
– septic 673

PAGE

Pharyngitis sicca 675
Pharynx, cancer of, radium treatment 760
– – treatment by rest .. 136
– foreign bodies in (*see* Foreign Bodies)
– malignant disease of (*see* Mouth and Pharynx)
– septic and tuberculous abscesses of .. 671, 856
Phenazone (antipyrine), poisoning by 694
Phenol (carbolic acid), poisoning by 694
PHIMOSIS 675
– as a complication of chancroid 150
PHLEBITIS 677
– gouty 405
– with puerperal sepsis .. 726
PHLEBOTOMUS FEVER .. 678
Phlegmasia alba dolens, prevention of 677
Phlyctenular conjunctivitis 194
– disease, blepharospasm in 195
– keratitis 194, 195
– pannus 195
Phobias (*see* Neurasthenia, 634; Psychoneuroses, 713)
PHOSPHATURIA 678
Phosphorus, necrosis of jaw caused by 508
– poisoning 694
PHOTOTHERAPY 678
– Dowsing incandescent lamp 680
– the electric arc lamp .. 679
– Finsen light 680
– leucodescent lamps .. 679
Photophobia with measles .. 556
Phthisis (*see* Pulmonary Tuberculosis)
– laryngeal (*see* Larynx, Tuberculosis of)
Phytacogen treatment of acute rheumatism 780
Physical treatment 1
Pilocarpine poisoning .. 694
– value in chronic renal disease 615
Pituitary extract in shock .. 825
PITYRIASIS (Rosea, Versicolor) 681
Placebo, consolatory effect of 3
Placenta prævia, hæmorrhage from 423
Placental site, post-partum hæmorrhage from .. 424
PLAGUE 681
– serum treatment in .. 681
Plan, importance of in treatment 1
Plantar and palmar abscesses 9
– – arches, hæmorrhage from 987
Plethora, headache due to .. 438
PLEURISY 681
– acute 681
– chronic dry 682
– with effusion 682
– rheumatic 778
– thoracentesis in 682
Pleurodynia .. 778, 781
– phototherapy in 680
PLUMBISM 684
– electricity in 685
– neuritis due to 636
– prophylactic treatment .. 685
Pneumatic treatment of asthma 80
Pneumococcous infections, specific therapy in .. 846
PNEUMONIA (*see also* Bronchopneumonia, 125) .. 685

PAGE

Pneumonia, chest compress for 476
– to lessen toxæmia 686
– to limit extension of pulmonary lesion 686
– measles with 557
– to prevent or treat cardiac failure 687
– preventive treatment .. 689
– rheumatic 778
– specific therapy in .. 689
PNEUMOTHORAX 690
– artificial, in pulmonary tuberculosis 740
– bleeding in 690
POISONING 691
– acute diarrhœa due to .. 218
– snake-bite 829
POLIOMYELITIS AND ENCEPHALITIS, ACUTE 695
– – – electrotherapeutics in 696
– – – the late stage .. 697
– – – specific therapy in .. 695
– – – splints and apparatus for 696, 697
– – – stage of recovery .. 695
Politzer's bag, method of use 259
Pollaccine treatment of hay fever 434
Polypus of cervix uteri .. 562
– conjunctiva 183
– ear 258, 264
– maxillary antrum .. 643
– nasal 647
– of rectum 769
Popliteal aneurysm 50
Portal pyæmia as a complication of acute appendicitis 76
Port-wine stains 56
– – carbonic acid snow for .. 141
– – diathermy for 292
– – electrolysis in 283
– – radium treatment .. 764
– – *x* rays in 755
Post-cricoid tumours .. 592
Post-epileptic phenomena .. 305
Post-nasal catarrh as a cause of colic 164, 165
– – vomiting in childhood due to 972
– growths (adenoids) .. 13
Post-operative dilatation of stomach 881
– suppression of urine .. 962
– suppuration, vaccine therapy in 850
– tetany 394
– treatment, radium in .. 767
Post-partum eclampsia .. 269
– hæmorrhage 424
Posterior basic meningitis .. 561
Posture in pulmonary congestion and œdema .. 175
Potash, caustic, poisoning by 692
Potassium chlorate poisoning 694
Pott's disease 854
– puffy tumour 103
Pouches, œsophageal .. 657
Pregnancy, albuminuria in .. 270
– as a complication of cancer of breast 115
PREGNANCY, DISORDERS OF .. 698
– – pruritus vulvæ 699
– – salivation and heartburn 698
– – toothache 699
– – vomiting 698
– eclampsia in 271
– measures to prevent rickets in children 795
– pyelitis of 744
PRESCRIBING 679
– incompatibility in .. 700

PAGE

Pressure treatment of aneurysm 45
– – – objections to .. 47
– – sprains—method .. 862
– – in tuberculous joints .. 515
PRIAPISM 704
Primary and delayed primary suture for shell wounds 412
Probe, passing of, in dacryocystitis 526
Procidentia 769
PROCTITIS 704
– ionization in 280
– pruritus due to 710
Prodromata of mental disease 571
Progressive muscular atrophy, massage in 555
Prolapse of ciliary body and choroid 319
– iris 318
– rectum 769
– uterus and vaginal walls 964
Prolapsus ani in infantile diarrhœa 221
Prophylactic use of sera and vaccines 839
PROSTATE, ENLARGEMENT OF 705
– – catheterization in .. 706
– – hydronephrosis due to 469
– – retention of urine with 960
– – *x* rays in 756
– malignant disease of 705, 706
Prostatitis, gonorrhœal .. 397
Prostatocystitis, gonorrhœal 204
Protein treatment of hæmophilia by Witte's peptone 418
Proteins in foods, tables of 212–15
Proximal ligature in aneurysm 48
PRURITUS 707
PRURITUS ANI 710
– – Ball's operation in .. 711
– in diabetes 217
– due to baths 709
– electricity in 709
– genitalium 708
– hiemalis 710
– radium treatment .. 766
PRURITUS VULVÆ .. 708, 711
– – in pregnancy 699
– *x* rays in 755
Psilosis 869
Psoas abscess (*see* Spine, Caries of)
PSORIASIS 711
– electricity and *x* rays in .. 713
of nails 601
– radiotherapy in 755
– radium treatment .. 766
Psychic influence of static electricity 292
Psycho-analysis 714
– in hysteria 486
– neurasthenia 634
Psychology, recent developments in 566
PSYCHONEUROSES 713
– hypnotism and suggestion in (*see* Hypnotism)
– persuasion treatment .. 717
– psycho-analysis — Freud's methods 714
– re-education 719
Psychotherapy (*see also* Hypnotism; Psychoneuroses, etc.) 4
– in early stage of mental disease 573
– neurasthenia 633
PTERYGIUM 719
Ptosis of eyelid 320
PUERPERAL SEPSIS (*see also* Septicæmia) 720
– – bacteriology of 721

PAGE

Puerperal sepsis, curettage in 722
– – douching in 724
– – drainage of cellular tissue in 724
– – – pelvic cavity in .. 722
– – hysterectomy in .. 723
– – ligation of pelvic veins in 723
– – nursing and diet in .. 726
– – prophylactic treatment 720
– – saline infusion in .. 725
– – salpingectomy and oöphorectomy in 723
– – specific therapy in 724, 725, 845
– – thrombophlebitis of pelvic veins due to 677
Puerperium, convulsions in 271
PULMONARY ABSCESS .. 727
– congestion and œdema (*see* Congestion, Pulmonary, and Œdema)
– œdema, rheumatic .. 778
PULMONARY TUBERCULOSIS .. 727
– – anæmia in 743
– – artificial pneumothorax in 740
– – chest compress for .. 476
– – climate in 734
– – clothing and skin hygiene 732
– – cough in 740
– – curability in early stages 727
– – diabetes with 217
– – dietary in 729
– – drug treatment .. 732, 737
– – dyspnœa in 741
– – expectoration in .. 741
– – gastro-intestinal disturbance in 742
– – hæmoptysis in 418
– – insomnia in 743
– – liability to, in whooping-cough 980
– – night sweating in .. 743
– – open air and sunlight in 728
– – pain in 741
– – pyrexia in 741
– – rest and exercise in .. 731
– – sanatoria in 733
– – specific therapy in 735, 737, 851
– – symptoms and complications 740
– – tuberculin in 735, 737, 851
– – ulcers of tongue with .. 930
– – variety of clinical types 727
Pulse in anæsthesia 39
Punctum, lower, method of dilating 525
Pupil, size of, in anæsthesia 40
Purgation in apoplexy 71, 72
Purgatives in acute nephritis 603
– chronic parenchymatous nephritis 608
– pneumonia 686
Purin-free diet in toxæmic headaches 438
PURPURA 744
Pyæmia 820
– necrosis of jaw from .. 508
– portal, as a complication of acute appendicitis .. 76
– specific therapy in 845, 846, 848
PYELITIS AND PYONEPHROSIS 744
– vaccine therapy in .. 850
PYELONEPHRITIS 745
Pylephlebitis as a complication of acute appendicitis .. 76
Pyloric hypertrophy, Congenital (*see* Congenital Pyloric Hypertrophy)
– obstruction, dilatation of stomach due to .. 881

PAGE

Pyloroplasty for congenital pyloric hypertrophy .. 173
Pyonephrosis 744
PYORRHŒA ALVEOLARIS .. 745
– – specific therapy in .. 845
Pyrexia in phthisis, prevention and treatment .. 741

QUARANTINE period in acute infectious fevers 328
– – chicken-pox 151
– – diphtheria 232
– – enteric fever 300
– – epidemic cerebrospinal meningitis 560
– – influenza 494
– – measles .. 328, 556
– – mumps 592
– – scarlet fever 812
– – small-pox 828
– – typhus fever 949
– – whooping-cough .. 980
Quinine, deafness due to .. 266
– intolerance of 550
Quinine, methods of administration, and dosage .. 549
Quinsy 9

RABIES 747
– – atropine in relieving throat spasm 747
– local treatment 747
– Pasteur's treatment and its modifications 748
Radiant heat apparatus .. 921
– – in gout 403
– – scars 813
Radical treatment 2
Radio-activity of mineral waters 406, 473
RADIOTHERAPEUTICS .. 750
– in acne 11, 754
– apparatus for 751
– in cancer of breast 115, 116, 138
– – nose 651
– dosage 752
– in eczema 755
– enlarged prostate 756
– exophthalmic goitre 385, 756
– favus 323
– histological basis of .. 750
– in hyperidrosis 756
– hypertrichosis .. 430, 755
– leprosy 537
– leukæmia .. 537, 756
– lupus 545, 755
– – erythematosus 545
– mastitis 112
– nævi 755
– neuralgia 756
– pruritus 709, 755
– psoriasis 713, 755
– ringworm 799
– redness of the nose .. 755
– rodent ulcer .. 755, 800
– scars .. 129, 812, 814
– splenic anæmia 861
– sycosis 887
– in tuberculous cervical glands 756
– – joints 514
– – periostitis 756
– – peritonitis 673
– uterine fibroids .. 329, 756
RADIUM THERAPY 757
– – in acute rheumatism .. 781
– – arthritis deformans .. 766
– – cancer 760
– – – of nose 651
– – – rectum .. 138, 769
– – – for relief of pain .. 138
– – in chronic metritis .. 765

PAGE

Radium therapy in eczema and psoriasis 766
– – exophthalmic goitre 385, 766
– – hypertrophic scars after burns 129
– – keloid 518, 764
– – leukæmia .. 539, 766
– – lichenification of skin .. 766
– – lupus 547, 765
– – – erythematosus .. 766
– – nævi 764
– – parotid tumours 765, 807
– – post-operative prophylactic irradiation .. 776
– – in pruritus .. 769, 766
– – reaction of tissues to .. 759
– – in rodent ulcer 801
– – sarcoma 763
– – – of bone 108
– – scars 812
– – splenic anæmia 861
– – technique 757
– – in tuberculous adenitis .. 765
– – uterine fibroids 329
Radius, dislocations of upper end of 236
– and ulna, fractures of .. 361
Rammstedt's operation for congenital pyloric hypertrophy 173, 174
RANULA 767
Rash, antitoxin, in diphtheria 227
Rat poisons 694
Rational treatment 2
RAYNAUD'S DISEASE .. 374, 767
– – Bier's hyperæmic treatment in 374
– – galvanism in .. 282, 374
Rectal administration of quinine 549
– conditions, spa treatment of 446
– crises of tabes 899
– feeding in valvular heart disease 452, 455
– sphincter, paralysis of, faradization in 285
Rectocele 964
RECTUM, DISEASES OF (*see also* Proctitis, 704) .. 768
– – cancer 768
– – – prevention of hæmorrhage 138
– – – treatment by radium 138, 761
– – – – rest 136
– – – cleanliness in treatment of 137
– – fissure, ionization in .. 280
– – polypi 769
– – prolapse 769
– – stricture 770
– – ulceration 771
– hæmorrhage from .. 989
– inflammation and ulceration of, ionization in .. 280
– results of excision of .. 768
Re-education of movements in hemiplegia 460
– in the psychoneuroses .. 719
– tabes 898
– tics 925
Reflex convulsions 191
– 'mass', significance in paraplegia 669
Refraction errors in squint .. 871
Reid's method in treatment of aneurysm 46
RELAPSING FEVER 771
Renal artery, aneurysm of .. 52
– calculus (*see* Calculus, Renal)
– causes of enuresis 301

PAGE

Renal dropsy (*see* Dropsy)
– extracts in acute nephritis 605
– – chronic nephritis .. 614
– hæmorrhage .. 415, 416
Resection of rib for empyema 294
Residual abscess as a complication of acute appendicitis 76
Respiration in anæsthesia 38
– artificial, Schäfer's method 242
– exercises in stammering .. 873
– – tics 925
Respiratory disorders, spa treatment of 444
Rest in acute chorea .. 154
– gastroptosis 379
– mental disease 872
– myocardial failure .. 593
– neurasthenia 632
– pulmonary tuberculosis .. 731
– sciatica 814
– thoracic aneurysm .. 53
– treatment of abscesses .. 8
– – cancer 136
– tuberculous disease of joints 813
– valvular disease .. 450, 453
Resuscitation methods in anæsthesia 40
Retention of urine 959
– – in fevers 328
– – nervous 303
– – in tabes 898
Retina, detachment of, glaucoma with 384
Retinitis in diabetes .. 217
Retrobulbar neuritis .. 659
Retroflexion and retroversion of uterus 964
Retropharyngeal abscess .. 674
Rheumatic alimentary disorders 778
– appendicitis 778
– chorea, acute 154
– diathesis, laryngitis with 531
– facial paralysis .. 322, 626
– headache 436
– iritis 502
– pleurisy 778
– pneumonia 778
– renal disease 779
– tonsillitis 779
RHEUMATISM, ACUTE .. 771
– – articular 771
– – – bee stings in 775
– – – convalescence from .. 774
– – – diet in 772
– – – medicines and applications 772
– – – surgical treatment .. 779
– – cardiac 775
– – erythema nodosum .. 779
– – with hyperpyrexia .. 777
– – phylacogen treatment .. 780
– – radium treatment .. 781
– – salicylate treatment 772, 779
– – serum and vaccine treatment 780
RHEUMATISM, CHRONIC .. 781
– – incision and injection of nodules 783
– – massage in 782
– – – myalgia 555
– – prophylaxis and prognosis 783
– – spas and climatic treatment 783
– gonorrhœal 398
– – vaccine therapy in .. 549
– muscular, phototherapy in 680
– with scarlet fever 811
– spa treatment 473
– true, lumbago due to .. 541

PAGE

RHEUMATOID ARTHRITIS .. 783
– – climate in 784
– – diet and clothing in .. 784
– – drug treatment .. 785
– – electricity in .. 281, 787
– – exercise in 784
– – seton treatment .. 823
– – surgical treatment .. 788
– – thermal treatment in .. 787
– – vaccines in 785
RHINITIS 789
– acute 789
– – adenoids causing .. 14
– – inoculation against .. 840
– atrophic 794
– caseosa 795
– chronic 790
– fibrinous 790
– hypertrophic 792
– – methods of turbinectomy 792
– perforating ulcer of septum with 645
– sicca 793
– – epistaxis due to .. 312
– vasomotor (hay fever) 434
Rhinoliths 646
Rhinophyma 802
Rhinorrhœa, paroxysmal (hay fever) 434
– with scarlet fever 811
Rhizotomy 622
Rib, cervical, nerve symptoms due to 624
– fractures of 363
– resection for empyema .. 294
RICKETS 795
– association of tetany with 919
– dietetic and general treatment 796
– knock-knee with 523
– prevention and relief of deformities 798
– prophylaxis 797
– symptoms and complications 797
Riddoch and Head's 'mass-reflex' in paraplegia .. 669
RINGWORM 798
– of nail 601
Riviera, climate of .. 293, 443
RODENT ULCER 799
– – carbonic acid snow for .. 141
– – diathermy in 291
– – ionization in 801
– – radium treatment 762, 801
– – *x* rays in .. 755, 800
Röntgen rays (*see* Radiotherapeutics; *X Rays*)
ROSACEA 802
Round worms 981
Rupture of crucial ligaments of knee 522
– sclerotic 315
– tendons 867, 912
– urethra 952

SAC, excision of in aneurysm 48
Sacro-iliac joint, tuberculous disease of .. 517
Salicylate of sodium in chorea 154
– treatment of acute rheumatism 772, 779
Saline baths 473
– infusion in acute nephritis 605
– – in eclampsia 272
– – infantile diarrhœa—technique 223
– – preparation of 942
– – in puerperal sepsis .. 725
– – sciatica 815
– – septicæmia and pyæmia 820

PAGE

Saline infusion in shock .. 825
– – uræmia 952
Salisbury treatment in toxæmic headaches .. 438
SALIVARY GLANDS, AFFECTIONS OF 802
– – – actinomycosis .. 804
– – – calculi 805
– – – fistula 806
– – – parotitis .. 803, 804
– – – syphilis, tuberculosis 804
– – – tumours 807
– – – wounds of parotid .. 808
– – – xerostomia 803
Salivation 802
– in pregnancy 698
Salpingectomy in puerperal sepsis 723
SALPINGO-OOPHORITIS .. 808
Salt-free diet in nephritis .. 606
Salts of lemon, salts of sorrel, poisoning by (*see* Acid, Oxalic) 694
Salvarsan treatment of syphilis 890
– – – of nervous system .. 895
– – syphilitic meningitis .. 561
– – tabes 896
Sanatoriums in pulmonary tuberculosis 733
Sandalwood oil in acute gonorrhœal cystitis 201
Santonin poisoning 694
Sarcoma of bone 107
– conjunctiva 183
– of external auditory meatus 258
– jaw .. 509, 510, 511
– lympho- 548
– of middle ear 265
– mouth and pharynx .. 586
– nerves 638
– nose 651
– prostate 706
– radium treatment 763
– of thyroid 389
– tongue 931
– *x* rays in 757
Savin poisoning 694
SCABIES 808
Scalds (*see* Burns and Scalds)
– acute œsophagitis caused by 655
SCALP, CONTUSIONS OF .. 809
– hæmorrhage from .. 987
SCALP WOUNDS 809
Scapula, fractures of .. 356
SCARLET FEVER 810
– – cervical cellulitis with .. 810
– – otitis media with .. 810
– – rheumatism with .. 811
– – rhinorrhœa with .. 811
– – serums and vaccines in 811
Scarring and deformity due to burns and scalds .. 129
SCARS 812
– from acne, small-pox, etc. 813
– adhesions due to 813
– associated with ulceration 813
– effect of chlorine ions on 280
– painful 813
Schäfer's method of artificial respiration 242
Schick reaction for immunity to diphtheria 232
Schirrus, atrophic, of breast 114
Schistosoma infections .. 96
Sciatic nerve, injuries of .. 625
SCIATICA 814
– application of heat .. 814
– Bier's hyperæmic treatment in 94
– in diabetes 217
– electricity in 289, 292, 815
– massage in .. 555, 815

PAGE

Sciatica, rest treatment .. 814
– saline infusions in .. 815
– spa treatment 816
– surgical treatment .. 816
SCLERITIS 816
Sclerosis, disseminated .. 239
– – massage in 555
Sclerotic, foreign bodies in .. 315
– rupture of 315
– wounds of 319
– – non-perforating .. 316
SCOLIOSIS 816
– jackets and supports for 817
– postural 816
– structural 816
SCURVY 818
SCURVY, INFANTILE 818
– prophylaxis of 818
SEA-SICKNESS 819
Sebaceous cysts of auricle .. 254
SEBORRHŒA 819
– as a cause of baldness .. 429
– rosacea following 802
Secondary hæmorrhage in gunshot wounds .. 413
– suture of shell wounds .. 412
Sedatives in chronic nephritis 615
– mental disease .. 573, 578
– pneumonia 687
– valvular heart disease .. 455
Semilunar cartilages of knee, derangements of .. 520
Sensory aphasia 67
Senile cataract 146
– deafness 268
– ectropion 321
– gangrene 374
– insomnia 495, 497
Sensitized vaccines 834
Separation of epiphyses of humerus 359, 360
Sepsis in operations on mouth and pharynx 587
– puerperal (*see* Puerperal Sepsis)
– after tooth extraction .. 910
Septic anæmia .. 23, 28
– conditions of head and neck, Bier's hyperæmic treatment in 92
– diarrhœa of infants .. 222
– injuries with lymphangitis and cellulitis, Bier's hyperæmic treatment in 92
– ulcers, ionization in .. 279
– wounds of eye 317
SEPTICÆMIA AND PYÆMIA .. 820
– specific therapy in 845, 846, 848
– staphylococcus, blood transfusion in 937
SEPTUM NASI, ABNORMALITIES OF 820
– – abscess of 822
– – atrophic or perforating ulcer of 645
– – cauterization in hay fever 435
– – submucous resection of—technique 821
– – and turbinates, adhesions between 822
Sequestrum in acute bone inflammations, investigation by *x* rays 101
– – – – removal of .. 101
Sera, immune, preparation and standardization of 834
– methods of administration 836
– prophylactic use of .. 839
Serous or albuminous periostitis and osteomyelitis 100, 103
– cysts of auricle 254

PAGE

Serum, antitetanic, in gunshot wounds 412
– antivenomous 829
– injections, method in meningitis 559
– – non-specific effects of .. 837
– sickness 837
– therapy in acute chorea .. 156
– – of hæmatemesis .. 415
– – hæmophilia 417
– – hæmorrhagic disease of the newly-born .. 425
– – pernicious anæmia .. 32
– – (*see also* Specific Therapy)
SETON, TREATMENT BY .. 822
– – in headache 440
– – how to make and use a seton 823
– – in migraine 584
Sewer gas poisoning .. 694
Sexual incompatibility and sterility 879
Shell wounds 411
Shock after anæsthesia .. 41
– avoidance of stimulants in 825
– due to burns and scalds .. 126
– complex, gum transfusion in 941
– deferred 826
– due to wounds of soft parts 982
– prevention of 824
SHOCK, SURGICAL 824
Short-circuiting for chronic constipation 189
Shoulder, bony ankylosis of 63
– dislocations of 233
– – habitual 235
– – Kocher's method in .. 234
– – subspinous and subclavicular 234
– – unreduced 235
– tuberculous disease of .. 516
Silver nitrate in chronic infantile diarrhœa 224
– – cœliac disease 163
– – conjunctivitis, method of application .. 177, 178
– salts, poisoning by 694
Simpson's rat paste, poisoning by (Arsenic) 691
Singer's nodules 532
Sinus arrhythmia 449
– infections, specific therapy in 847
Sinuses in amputation stumps 885
– bone 102, 103
– – in tuberculous osteitis .. 105
– ionization in 280
– persistent, with mammary abscess 551
Sinusitis, nasal accessory (*see* Nose, Accessory Sinuses of)
Skin affections, hydrotherapy in 473
– – ionization in 280
– – spa treatment 445
– cancer of, radium treatment 760
– lichenification of, radium treatment 766
SKULL, FRACTURES OF .. 826
– gunshot wounds of .. 414
Sleep, importance of in acute bronchitis 120
– – pneumonia 687
Sleeping sickness 944
Sleeplessness (*see* Insomnia)
SMALL-POX 827
– care of eyes in 828
– laryngeal and other complications 828
– scars from 813
Smell, loss of sense of .. 64

PAGE

Smell, unpleasant, in nose .. 670
Smokers' patch 928
SNAKE-BITE 829
– antivenomous serum .. 829
– the venoms of 829
Soap lees poisoning (Caustic Potash) 692
Soda baths 473
– caustic, poisoning by (Caustic Soda) 692
Soothing syrup, poisoning by (Opium) 694
Soporifics in valvular heart disease 455
Sore throat (*see* Laryngitis; Pharyngitis)
Southey's tubes, when indicated in renal dropsy .. 242
SPA TREATMENT 441
– – action of mineral-water baths 472
– – of anæmia 446
– – chlorosis 28
– – chronic rheumatism .. 783
– – circulatory disorders .. 444
– – classification of spas .. 443
– – of cutaneous affections 445
– – cystitis 203
– – gout 406, 443
– – – classification of waters in 407
– – gouty eczema 404
– – habitual constipation .. 186
– – in obesity 654
– – radio-activity of waters 406
– – of rectal and pelvic conditions 446
– – renal calculus 135
– – respiratory disorders .. 444
– – in rheumatoid arthritis 787
– – sciatica 816
– – syphilis 446
– – tabes 897
Spasm, facial 323
– laryngeal, in childhood .. 529
– reflex, retention of urine due to 960
Spasmodic conditions, hydrotherapy in 470
– constipation 188
– stricture of urethra .. 958
Spasmus nutans 652
SPECIFIC THERAPY (*see also* Serum; Vaccines) .. 832
– – in abscesses .. 845, 848
– – acne 847
– – acute dysentery 247, 248
– – – general infections .. 848
– – – rheumatism 780
– – anaphylaxis 837
– – in anthrax 847
– – bacillus coli infections .. 850
– – bronchitis, asthma, and bronchopneumonia .. 846
– – cellulitis 845
– – cerebrospinal meningitis 559, 847
– – – – intraventricular injections 560
– – choice of dose and frequency of administration 841
– – – remedies 834
– – in chronic general infections 848
– – ciliary blepharitis .. 488
– – colitis 850
– – diphtheria 843
– – duodenal ulcer 244
– – eczema 847
– – empyema 846
– – enteric fever 300, 839, 850
– – erysipelas .. 313, 845

PAGE

Specific therapy in exophthalmic goitre .. 386
– – gonococcus infections 849
– – gonorrhœa 396
– – hay fever 434
– – infective endocarditis 845
– – leprosy 536
– – Meibomian cyst 847
– – osteomyelitis 848
– – passive and active immunity 823
– – in pernicious anæmia .. 32
– – plague 681
– – pneumococcus infections 846
– – pneumonia 689
– – poliomyelitis and encephalitis 695
– – posterior basic meningitis 561
– – post-operative suppuration 850
– – preparation and standardization of sera .. 834
– – in puerperal sepsis .. 774
– – pyorrhœa alveolaris .. 845
– – rabies 748
– – rheumatoid arthritis .. 785
– – scarlet fever 811
– – scope of 832
– – septicæmia and pyæmia 845, 846
– – sinuses 847
– – snake-bite .. 829, 831
– – sprue 870
– – staphylococcus infections 847
– – streptococcus infections 844
– – sycosis 887
– – syphilitic meningitis .. 561
– – tetanus 844, 917
– – toxins and antibodies .. 833
– – in tuberculosis 851
– – tuberculous glands .. 949
– – urinary-tract infections 850
– – whooping-cough .. 980
– – yellow fever 990
Spermatocele 458
SPERMATORRHŒA 852
Sphincter ani, stretching for internal piles 427
– atony of, causing enuresis 302
– iridis, paralysis or rupture of 315
Sphincters, paralysis of, faradization in 285
SPINA BIFIDA 852
Spinal accessory nerve, injuries of 628
– disease, retention of urine in 960
– syphilis (*see* Syphilis of Nervous System)
SPINAL TUMOURS 853
SPINE, CARIES OF 854
– – abscesses with 856
– – bone grafting in 855
– – Hibbs' operation .. 854
– – paraplegia with 668, 857
SPINE, FRACTURES AND DISLOCATIONS OF 857
– – prevention and treatment of bed-sores 859
– lateral curvature of (scoliosis) 816
Spleen, effect of *x* rays on 538, 861
– gunshot wounds of .. 414
– injuries of 5
Splenectomy in leukæmia .. 539
– pernicious anæmia .. 32
SPLENIC ANÆMIA 860
– – radium and *x* rays in 861
– – splenectomy in .. 861
– leukæmia, radium treatment 766
– – *x* rays in 756
Splenomedullary leukæmia 538
Splints, for fractures .. 353, 366

PAGE

Splints for femur 366
– knock-knee 523
– ruptured crucial ligaments 522
– spinal caries 856
– synovitis 888
– talipes 906
– torn and displaced cartilage of knee 520
– tuberculous disease of joints 514
SPRAINS (*see also* Synovitis, 887) 861
– articular 861
– Bier's hyperæmic treatment in 866, 869
– complicated 865
– electricity in 866
– with fractures and dislocations 866
– hæmatomata with .. 865
– hydrotherapy in .. 868
– ionization for 869
– loose bodies with 866
– massage in .. 555, 863
– mechanotherapy for .. 869
– method of pressure treatment 862
– muscles 867
– nerve injury complicating 865
– recurring and relapsing cases 864
– sequelæ of 868
– tension in joint after .. 864
Spring catarrh of the conjunctiva 182
SPRUE (*see* also Diarrhœa, Hill, 220).. 869
Spurs in amputation stumps 885
SQUINT 870
STAMMERING 872
– educative treatment .. 875
– exercises for 873
– prophylactic treatment .. 872
Staphylococcus infections, specific therapy in .. 847
– septicæmia, blood transfusion in 937
Staphylomatous cornea in blind eye 194
Starchy foods in gout .. 409
Starvation treatment in acute nephritis 602
Stasis, intestinal 499
– – surgical treatment of .. 188
Status epilepticus 306
Steam box, or Berthollet bath 920
Stenosis of punctum causing epiphora 525
– pylorus, congenital (*see* Congenital Pyloric Hypertrophy)
STERILITY 878
– danger in *x*-ray operators 546
– due to the female (*see also* Dyspareunia, 249 ; Vaginismus, 965) 879
– – the male 878
Stiff neck 781
Stimulants in acute infectious diseases 325
– avoidance in surgical shock 825
– in pneumonia 688
– pneumothorax 690
Stokes-Adams syndrome .. 109
STOMACH, CARCINOMA OF .. 880
– – measures to relieve pain 880
– – radium treatment .. 762
– – surgical treatment .. 880
– chronic catarrh of .. 378
STOMACH, DILATATION OF .. 881
– – post-operative 881
STOMACH, FOREIGN BODIES IN 882
– gunshot wounds of .. 414

PAGE

Stomach, hæmorrhage from .. 415
– method of massage of .. 554
STOMATITIS, catarrhal, aphthous, ulcerative, gangrenous 882
– mercurial 508
– necrosis of jaw due to .. 507
Stone (*see* Calculus)
Strabismus 870
Strains (sprains) 862
Stramonium poisoning .. 694
Strangulated hernia 464, 465
Streptococcus infections, specific therapy in 844
Stricture of œsophagus .. 656
– rectum 770
– of urethra, hydronephrosis due to 469
– – retention of urine with 961
– – spasmodic 958
Stridor, laryngeal, congenital 529
Strophanthus in myocardial failure 598
– valvular heart disease 449, 451, 454
Strumitis, acute (thyroiditis) 924
Strumous dactylitis (*see* Bone, Tuberculous Disease of)
Strychnine poisoning .. 694
– in pneumonia 688
– – valvular disease of heart 449, 451, 454
STUMP, TREATMENT OF .. 883
– – nerve complications .. 885
– – persistent infection .. 885
Styes 320
Subastragaloid dislocations 239
Subclavian aretry, aneurysm of 51
– vessels, arteriovenous aneurysm of 52
Subclavicular dislocations .. 234
Subcoracoid dislocations .. 234
Subdeltoid bursa, affections of 131
Subglenoid dislocations .. 234
Sublingual ulcers, with whooping-cough 980
Submammary abscess .. 551
Submaxillary abscess .. 10
– gland, excision of 805
SUBPHRENIC ABSCESS .. 886
Subspinous dislocations of shoulder 234
Suffocation (*see* Drowned, Treatment of the apparently, 242 ; Laryngeal Obstruction, 527 ; Poisoning, 691)
Sugar in gout 409
Suggestion treatment (*see also* Hypnotism, 478)
– – in enuresis 302
– – hemiplegia 460
– – hysteria 485
– – neurasthenia 633
– – vomiting of pregnancy 698
Sulphonal in insomnia .. 496
– in mental disease 578
Sulphur baths 473
– – in gouty eczema.. .. 404
Sulphuretted hydrogen, poisoning by (Sewer Gas) .. 694
Sulphuric acid, poisoning by 691
Summer diarrhœa of infants 222
Sun-baths 456
– – in tuberculous disease of joints 513
Sunshine in treatment of cancer 138
SUNSTROKE 886
Suppression of urine .. 961

PAGE

Suppuration after cataract extraction 148
– post-operative, vaccine therapy in 850
Suprarenal gland in asthma 79
Surgical shock 824
Suture of the aneurysmal openings in treatment of of aneurysm 48
– methods of, in wounds of soft parts 984
– of nerves 616
Sweating (*see* Perspiration)
SYCOSIS 887
– ionization in 280
– specific therapy in .. 847
– *x* rays in 887
Symblepharon .. 181, 182
Sympathetic nerve cord, injuries of 628
– ophthalmia 658
Symptomatic treatment .. 2
Synechia with iritis 501, 504
Synovial membrane of knee, hypertrophy of .. 522
SYNOVITIS, TRAUMATIC (*see also* Sprains, 861) .. 887
SYPHILIS 889
– anal warts of 65
– ante-natal treatment .. 894
– of auricle 255
– as a cause of baldness .. 429
– deafness due to 268
– inherited, interstitial keratitis in 195
– mercury treatment .. 891
– of middle ear 265
– necrosis of jaw from .. 508
SYPHILIS OF THE NERVOUS SYSTEM 894
– – – value of iodides in .. 895
– nose 648
– œsophagus 655
– paraplegia due to 667
– recurring laryngeal obstruction due to 529
– relation of tabes to .. 895
– of salivary glands .. 804
– salvarsan treatment .. 890
– spa treatment 446
Syphilitic bursitis 131
– headache 435, 441
– iritis 501
– meningitis 560
– onychia 601
– ulcers, ionization in .. 280
– – of tongue 929
Syringing, danger with foreign bodies in nose 646
– of ears—method .. 256

TABES DORSALIS 895
– – antisyphilitic treatment 895
– – the ataxia of 898
– – crises of 899
– – disorders of micturition in 898
– – lightning pains of .. 897
TACHYCARDIA 900
– paroxysmal 901
Tænia (*see* Worms, Intestinal)
TALIPES, ACQUIRED 901
– calcaneocavus 903
– calcaneovalgus 903
– calcaneus 905
TALIPES, CONGENITAL .. 903
– – relapsed and neglected cases 908
– equinovalgus 904
– equinovarus 903
– – paralytic 902

PAGE

Talma's operation in ascites 158
Tapeworms 980
Tapotement, method of .. 552
Tapping (*see also* Paracentesis)
– hydrocele, method of .. 467
– in hydrocephalus 469
– myocardial failure .. 599
– pleurisy 682
Tarsal bones, fractures of .. 369
– cyst 319
– – specific therapy in .. 847
– tuberculous disease of .. 516
Tartar emetic, poisoning by 694
Teeth, artificial cleansing of 911
– care of, in prevention and treatment of oral sepsis 659
TEETH, CARIES OF 909
– – and antral suppuration 642
– – hæmorrhage after extraction 911
– – preventive treatment .. 911
– – septic sockets 910
– in causation of headache 437
– infantile convulsions associated with cutting of 190, 191
– relation to pyorrhœa alveolaris 746
– septic, a cause of septic anæmia 28
– treatment of, before operations in mouth 588
Telangiectases, epistaxis due to 312
Temporal arteries, compression of, in headache .. 441
Temporomaxillary joint, bony ankylosis of 63
Tendon division and transplanation in poliomyelitis and encephalitis .. 696
TENDONS, INJURIES OF .. 911
– – dislocation 913
– – – and displacement .. 867
– – rupture 867, 912
– – section 911
– sprains and strains of .. 867
TENDONS AND TENDON-SHEATHS, INFLAMMATION OF .. 914
Tenocellulitis 914
Tenosynovitis 914
– Bier's hyperæmic treatment 92
Testicle, atrophy of, after varicocele 966
– disease of (*see* Epididymitis; Gonorrhœa; Orchitis)
– – hydrocele complicating 467
TESTICLE, IMPERFECTLY DESCENDED 915
TETANUS 916
– antitoxin treatment .. 917
– diet and nursing in .. 916
– prophylactic treatment 412, 916
– specific therapy in .. 844
TETANY IN CHILDHOOD .. 918
– after thyroid operations .. 394
Thermal treatment of gonorrhœa 395
Therapeutics, some general principles of 1
THERMOTHERAPY (*see also* Heat) 919
– dry heat 920
– luminous radiant heat .. 921
– moist heat 919
– in rheumatoid arthritis .. 787
– sciatica 814
Thigh, amputation stump .. 885
Thirst after anæsthesia .. 41
Thomas bed knee-splint, modifications of 366
– splints in tuberculous hip disease 517

PAGE

Thoracentesis in empyema .. 293
– pleurisy 682
– pneumothorax 690
– technique of 683
Thoracic aneurysm (*see* Aneurysm, Thoracic)
– aortitis 88
Thorax, gunshot wounds of 414
Threadworms 981
Throat, burns and scalds of 129
– compress for 476
Thrombophlebitis (*see* Phlebitis)
Thrombosis, cerebral (*see* Apoplexy) 67
– of cerebral vessels (*see* Apoplexy from Occlusion of Cerebral Vessels)
– in enteric fever 300
THRUSH 923
Thumb, dislocation of .. 236
– fracture of 363
– tuberculous disease of .. 515
Thyroid, control of generalized disease of 391
– disease, *x* rays in diagnosis 390
– extract for chilblains .. 151
– grafting 392
– operations, after-treatment 394
– – anæsthesia in 393
– – enucleation 393
– – in exophthalmic goitre .. 387
– – general features of .. 393
– – hemithyroidectomy .. 393
– – in intrathoracic goitre .. 394
– – tetany after 394
– preparations of, in cretinism 199
– treatment of myxœdema .. 600
– 'tumours' 389
THYROIDITIS, ACUTE 924
Thyrotomy in cancer of larynx—method .. 533
Tibia and fibula, fractures of 368
Tic douloureux (*see also* Neuralgia) .. 629, 631
– facial 323
TICS (*see also* Wry Neck, 989) 924
– re-education treatment .. 925
Tinnitus 268
– from internal-ear disease 266
Tobacco and acute laryngitis 530
– deafness due to 266
– erythromelalgia due to .. 314
– poisoning 694
Toe, hammer-, as a cause of corns 196
– over-riding of one by another as a cause of corns 197
TOE-NAIL, INGROWING .. 927
Toes, amputation stumps .. 884
– fractures of 370
– tuberculous disease of .. 516
TONGUE, AFFECTIONS OF THE 927
– – acute and chronic glossitis 928
– – tongue-tie 927
– – ulcers, dyspeptic .. 928
– – – syphilitic 929
– – – traumatic 929
– – – tuberculous 930
– – wounds 927
– cancer of 590
– – radium treatment .. 760
– – treatment by rest .. 136
– neuralgia of, resection of lingual nerve in 627
TONGUE, TUMOURS OF .. 930
Tonsil, cancer of 591
– hæmorrhage from .. 987
– malignant disease of (*see* Mouth and Pharynx) .. 587

PAGE

TONSILLITIS, CHRONIC .. 931
– – removal by dissection .. 933
– – – cocheretic route .. 934
– – – with guillotine .. 932
– – compress for 476
– rheumatic 779
Tooth extraction, hæmorrhage after 911, 988
– – sepsis after 910
– socket, infected, necrosis of jaw due to 507
Toothache, causes of .. 909
– palliative treatment .. 910
– in pregnancy 699
TORTICOLLIS, CONGENITAL .. 935
– – manipulative treatment 935
– – operative treatment .. 936
– re-educational treatment .. 926
Toxæmia, deafness due to .. 268
– indigestion, headache from 438
– in pneumonia, to lessen .. 686
– renal (*see* Nephritis, Chronic, 615; Uræmia, 951)
Toxic atherosclerosis .. 86
Toxins and antibodies .. 833
Trachea, foreign bodies in (*see* Foreign Bodies in Air-passages) 332
– pressure of goitre on .. 389
Tracheobronchoscopy, contra-indications and dangers 344
– inferior and peroral methods 339
Tracheotomy, bloodless and rapid method 334
– in laryngeal tuberculosis 536
– rapid and safe method of 528
Trachoma, carbonic acid snow for 142
– chief dangers of 184
– ionization in 280
– treatment of complications 182
TRANSFUSION 936
– blood, group testing .. 940
– – indications for, and results 936
– – in pernicious anæmia .. 33
– – risks and reactions .. 939
– – technique 937
– gum 941
– – indications for 941
– – method of administration 941
– saline (*see also* Saline Infusion) 942
– – preparation of the solution 942
– in shock 982
Traumatic cataract 145
– chronic bursitis 139
– gangrene 375
– paraplegia 668
Treatment, dietetic 3
– empirical 2
– expectant 2
– faddiness to be avoided in 1
– general management of .. 3
– some general principles of 1
– importance of a definite plan in 1
– of incurable patients .. 4
– limitations of 4
– medicinal 3
– operative 4
– physical 4
– by psychotherapy 4
– radical 2
– rational 2
– specific 3
– symptomatic 2
Trephining for glaucoma .. 382
– organic headache 436
Trethowan's sole-plate for flat-foot 331

PAGE

TRIGGER FINGER 942
Tropical anæmia 33
– diarrhœa 225
Truss treatment of inguinal hernia 463
TRYPANOSOMIASIS 943
Tuberculin treatment .. 851
– – in cystitis 205
– – epididymitis 304
– – joint disease 513
– – lupus 547, 649
– – osteitis 104
– – pulmonary tuberculosis 735
– – tuberculous glands .. 949
Tuberculosis of internal ear 268
– of larynx (*see* Larynx)
– middle ear 265
– œsophagus 655
– pulmonary (*see* Pulmonary Tuberculosis)
– specific therapy in .. 851
– spine, paraplegia due to .. 668
Tuberculous abscess of pharynx 674
– adenitis, radium treatment 765
– – *x* rays in 756
– ankylosis, prevention of .. 61
– bursitis 130
– cystitis (*see* Cystitis)
– epididymitis 303
– – Bier's hyperæmic treatment in 92
TUBERCULOUS GLANDS .. 944
– – irritative causes of development 945
– – operative and immunizing treatment 946
– – prophylactic treatment 946
– – salivary 804
– – tuberculin treatment .. 851
– – vaccine treatment .. 949
– – *x* rays in 756
– iritis 502
– joints 512
– – Bier's hyperæmic treatment in 92
– lymphadenoma 548
– meningitis 560
– necrosis of jaw 508
– onychia 601
– osteitis (*see* Bone, Tuberculous Disease of)
– periostitis, *x* rays in .. 756
– peritonitis 672
– – tuberculin treatment .. 851
– tenosynovitis 915
– ulcers, ionization in .. 280
– – of tongue 930
Tumour of bone 106
– breast 112
– conjunctiva 183
– intracranial 499
– of jaw 508
– nerves 638
– nose 650
– parotid, radium treatment 765
– pressure of, causing paraplegia 668
– of salivary glands 807
– spinal 853
– thyroid 389
– of tongue 930
Turbinates, adhesions between septum and 822
– cauterization and resection in hay fever 435
– – in rhinitis 791
Turbinectomy in hypertrophic rhinitis—technique .. 792
Turkish bath, dangers in gout 404
– – objections to 920
Turpentine poisoning .. 694

PAGE

Tweedy's pill in herpes ophthalmicus 195
Twilight sleep in prevention of shock 825
Tympanites in enteric fever 298
Typhlitis (*see* Appendicitis)
Typhoid fever (*see* Enteric Fever)
TYPHUS FEVER 949
Tyrnauer's hot-air apparatus 921

ULCERS 949
– anæmic 950
– atrophic or perforating, of septum nasi 645
– callous 950
– corneal (*see* Cornea)
– duodenal 244
– of eyelid 321
– gastric 375
– ionization in .. 279, 280
– inflamed 950
– irritable 950
– after nerve injuries .. 619
– of œsophagus 655
– perforating 950
– phagedænic 951
– of rectum 771
– – and colon, ionization in 280
– rodent (*see* Rodent Ulcer)
– scars associated with .. 813
– sublingual, with whooping-cough 980
– of tongue, dyspeptic .. 928
– – traumatic, syphilitic .. 929
– – tuberculous 930
– varicose 950
– and wounds, high-frequency current in 290
Ulceration, secondary, after gastrojejunostomy .. 377
Ulcerative colitis .. 167, 168
– – diarrhœa of .. 218, 220
– stomatitis 882
Ulcus molle 150
– – serpiginosum 151
Ulna and radius, fractures of 361
Ulnar nerve, injuries of .. 624
Umbilical hernia 465
Unconscious versus conscious mind 567
UNDULANT FEVER 951
Unger's method of blood transfusion 938
Uræmia, chronic 615
URÆMIA, RENAL TOXÆMIA .. 951
Uræmic headache 439
Uranium in lupus 547
Ureteric calculus 133
URETHRA, RUPTURE OF .. 952
URETHRA, STRICTURE OF .. 954
– – catheter fever in .. 957
– – complications of dilatation 957
– – cutting operations .. 958
– – hæmorrhage during dilatation 957
– – hydronephrosis due to .. 469
– – method of dilatation .. 954
– – spasmodic 958
URETHRAL CARUNCLE .. 953
– – carbonic acid snow for 142
– sphincter, paralysis of, faradization in 285
– tenderness, dyspareunia due to 249
Urethritis, gonorrhœal (*see* Gonorrhœa)
– – in the female 399
– – vaccine therapy in .. 849
URIC ACID GRAVEL 958

PAGE

Urinary disorders in tabes .. 898
– tract infections, vaccine therapy in 850
Urine, alkaline or hyperacid, in causation of enuresis 301
– incontinence of (*see* Enuresis: Incontinence)
URINE, RETENTION OF .. 959
– – in acute inflammation of urethra 959
– – from blocking of urethra 960
– – with enlarged prostate 960
– – in fevers 328
– – nervous 303
– – from reflex spasm .. 960
– – in spinal disease .. 960
– – with stricture 961
URINE, SUPPRESSION OF .. 961
– – post-operative 962
Urine tests for diabetes .. 207
URTICARIA 962
– in antitoxin treatment of diphtheria 227
– giant 963
– lichen urticatus 963
Uterine hæmorrhage (*see* Hæmorrhage, Uterine)
– myoma, *x* rays in 756
– sepsis, thrombophlebitis of pelvic veins due to .. 677
Uterus, cancer of, cleanliness in treatment of 137
– – radium treatment of .. 761
– chronic infection of, ionization in 280
– conditions causing hæmorrhage 562
UTERUS, DISPLACEMENTS OF 963
– – anteflexion and anteversion 963
– – chronic inversion .. 965
– – prolapse of uterus and vaginal walls 964
– – retroflexion and retroversion 964
– fibroids of 329
– – radium in 765
– hæmorrhage from 989
– polypus of cervix 562
Uveal tissue, prolapse of .. 318

VACCINATION in diphtheria carriers .. 232
– inoculation, immediate effects of 838
Vaccine, bacterial 834
– mode of administration .. 837
– preparation and standardization of .. 835, 836
– prophylactic use of .. 839
– sensitized 834
– stock, use of .. 842, 850
– therapy in acne 11
– – acute chorea 156
– – – rheumatism .. 780
– – – rhinitis 790
– – cerebrospinal meningitis 560
– – chronic bronchitis .. 121
– – enteric fever .. 300, 839
– – enuresis 301
– – furunculosis .. 100, 847
– – gonorrhœa 396
– – gonorrhœal vulvo-vaginitis 974
– – osteomyelitis .. 101, 103
– – parotitis 803
– – puerperal sepsis 725
– – rabies 748
– – rheumatoid arthritis .. 785
– – scarlet fever 811
– – septicæmia and pyæmia 820

PAGE

Vaccine therapy in sprue .. 870
– – before surgical operations 839
– – in sycosis 887
– – tuberculous glands .. 949
– – whooping-cough .. 980
Vagina, cancer of, radium treatment 761
– chronic infection of, ionization in 280
Vaginal causes of dyspareunia 249
– and vulvar gonorrhœa .. 399
– walls and uterus, prolapse of 964
VAGINISMUS 965
– sterility due to 879
Vaginitis in children .. 974
– gonorrhœal, vaccine therapy in 849
Valvular disease (*see* Heart)
Vapour baths 920
Varicose veins, phlebitis with 677
Variola (*see* Small-pox)
Varicella 151
– bullosa 151
– gangrenosa 151
VARICOCELE 965
VARICOSE VEINS .. 950, 966
– – hæmorrhage from .. 967
– – technique of operation for 967
Varix, aneurysmal 49
Varus splints.. 906
Vascular spasm, hydrotherapy in 472
Vasodilators in chronic nephritis 614
Vegetable irritants, poisoning by 694
Vegetables for gouty patients 408
Veins and arteries, wounds of 985
– ligation of pelvic, in puerperal sepsis 723
– pressure of goitre on .. 389
Venesection in acute nephritis 604
– apoplexy 71
– beri-beri 90
– eclampsia 271, 272
– headache 440
– hyperpiesia 84
– myocardial failure.. .. 599
– pneumonia 686
– pneumothorax 690
– pulmonary congestion and œdema 175
– uræmia 952
– valvular heart disease .. 455
Venoms, snake 829
Venous depletion in apoplexy 71
Ventral hernia 465
Veratrine poisoning 694
Veratrone treatment of eclampsia 271
Verbal amnesia 67
Verdigris poisoning (*see* Copper Salts) 692
Vermin killers (poison contents of) 695
Veronal (barbitone) in insomnia 496
– mental disease 578
– poisoning by 692

PAGE

Vertebral artery, aneurysm of 52
VERTIGO 968
– auditory 268, 968
– seton treatment 823
Vesical calculus (*see* Calculus, Vesical)
– crises of tabes 899
– hæmorrhage 415, 416, 417
Vibration massage, method 553
VINCENT'S ANGINA 969
Visceral branches of aorta, aneurysms of 52
– crises of tabes 899
Visceroptosis (*see* Gastroptosis)
Visual aphasia 67
Vitriol, blue, poisoning by (*see* Copper Salts) .. 692
Vitriol, white, poisoning by (*see* Zinc Salts) 692
Vocal cords, affections of (*see* Laryngitis)
VOLKMANN'S ISCHÆMIC PARALYSIS 969
Volvulus, obstruction due to 498
Vomiting after anæsthesia .. 41
VOMITING IN CHILDHOOD .. 970
VOMITING, CYCLICAL .. 972
– – and delayed chloroform poisoning 152
– in diphtheria 228
– during exhibition of digitalis 448
– after gastrojejunostomy .. 377
VOMITING, HYSTERICAL .. 973
– of pregnancy 698
– in relation to dyspepsia .. 250
Von Noorden's dietary for obesity 653
Vulva, cancer of, radium treatment 761
– pruritus of (*see* Pruritus)
Vulvar causes of dyspareunia 249
– and vaginal gonorrhœa .. 399
VULVO-VAGINITIS 973

WARTS 974
– anal 65
– carbonic acid snow for .. 141
– diathermy for 292
– electrolysis for 284
– gonorrhœal 400
– ionization for 280
– on tongue 928
Wassermann test in syphilis 893
Water supply, relation to goitre 387
Wax in ear 256
Weaning 490
Weaver's bottom 131
Weir-Mitchell treatment .. 632
– – in hysteria 485
Whey in infant feeding .. 494
White precipitate poisoning 695
Whitehead's operation for internal piles are not recommended 429
WHITLOW 974
– Bier's hyperæmic treatment in 92

PAGE

Whitlow, importance of after treatment 976
WHOOPING-COUGH 979
– drug and vaccine treatment 978
– general hygienic treatment 976
– treatment of complications 980
Word blindness 67
WORMS, INTESTINAL 980
WOUNDS 982
– after dressings 984
WOUNDS OF ARTERIES AND VEINS 958
– examination of 983
– gunshot (*see* Gunshot Wounds)
– hæmorrhage from .. 982
– of liver (*see also* Abdominal Injuries, 5) 540
– methods of suture 984
– nerve injuries in 616
– of parotid gland 808
– penetrating, of bursæ .. 130
– rest and posture in treatment 984
– of scalp 809
– septic 983
– shock due to 982
– of tendons 911
– tongue 927
– and ulcers, high-frequency current in 290
Wrench, Thomas's, in flat foot 331
Wrist, amputation stump .. 884
– dislocation of 236
– tuberculous disease of .. 515
Writer's cramp 198
– – massage in 555
WRY NECK, SPASMODIC .. 989

XEROSIS of conjunctiva 182
– – with xerostomia .. 803
Xerostomia, or dry-mouth 803
X-ray diagnosis in thyroid disease 390
– examination in chronic constipation 189
– – of fractures 349
– investigation of sequestrum in acute bone inflammations 101
– locating foreign bodies in air-passages 346
– treatment (*see* Radiotherapeutics)
X rays, effect on operator 546

YAWS 980
YELLOW FEVER 980
Yew poisoning (Vegetable Irritants) 694

ZIEMSSEN bath 471, 472
Zinc salts, poisoning by 695
Zittmann's method in syphilis 893
Zomotherapy in pulmonary tuberculosis 730
Zoster (*see* Herpes Zoster)

JOHN WRIGHT AND SONS LTD., PRINTERS AND PUBLISHERS, BRISTOL.

JOHN WRIGHT & SONS LTD., PUBLISHERS, BRISTOL.

Published in July, October, January, and April. A Quarterly Journal devoted to Surgery. Lavishly illustrated in Colour, and Black and White.

Subscription **42**/– *net yearly, post free. Single Numbers,* **12**/**6** *net.*

Established 1913. *New Volumes commence in July. Subscriptions may begin at any time.*

BRITISH JOURNAL OF SURGERY.

UNDER THE DIRECTION OF THE FOLLOWING EDITORIAL COMMITTEE:

SIR BERKELEY G. A. MOYNIHAN, K.C.M.G., C.B. (Leeds), *Chairman.*

GEORGE E. ARMSTRONG (Montreal)
Sir HAMILTON A. BALLANCE, K.B.E., C.B. (Norwich)
Sir GILBERT BARLING, Bart., C.B., C.B.E. (Birmingham)
Sir WILLIAM BENNETT, K.C.V.O. (London)
JAMES BERRY (London)
ARTHUR H. BURGESS (Manchester)
FREDERIC F. BURGHARD, C.B. (London)
W. H. CLAYTON-GREENE, C.B.E. (London)
HERBERT S. CLOGG (London) [(Calcutta)
F. POWELL CONNOR, D.S.O., Brevet Lt.-Col. I.M.S.
EDRED M. CORNER (London)
JOSEPH F. DOBSON (Leeds)
Sir THOS. CRISP ENGLISH, K.C.M.G. (London)
CHARLES H. FAGGE (London)
JOHN FRASER, M.C. ((Edinburgh)
GEORGE E. GASK, C.M.G., D.S.O. (London)
W. SAMPSON HANDLEY (London)
RAYMOND JOHNSON, O.B.E. (London)
Sir ROBERT JONES, K.B.E., C.B. (Liverpool)
Sir W. ARBUTHNOT LANE, Bart., C.B. (London)
Sir ALEXANDER MACCORMICK (Sydney)
Sir GEO. H. MAKINS, G.C.M.G., C.B. LL.D. (London)
HENRY A. MOFFAT, D.S.O. (Capetown)
RUTHERFORD MORISON (Newcastle-on-Tyne)
Sir THOMAS MYLES, C.B. (Dublin)
R. H. PARRY (Glasgow)
Sir D'ARCY POWER, K.B.E. (London)
SIDNEY W. F. RICHARDSON (Capetown)
JAMES SHERREN, C.B.E (London)
GRAHAM S. SIMPSON (Sheffield)
THOMAS SINCLAIR, C.B. (Belfast)
Sir HAROLD J. STILES, K.B.E. (Edinburgh)
EDWARD H. TAYLOR (Dublin)
Sir J. LYNN-THOMAS, K.B.E., C.B., C.M.G. (Cardiff)
HENRY ALEXIS THOMSON, C.M.G. (Edinburgh)
Sir WILLIAM THORBURN, K.B.E,, C.B., C.M.G. (Manchester)
GEO. GREY TURNER (Newcastle-on-Tyne)
GEORGE E. WAUGH (London)
Sir W. I. DE COURCY WHEELER (Dublin)

E. W. HEY GROVES (Bristol), *Editorial Secretary.*

It is the earnest endeavour of the Editorial Committee and the Publishers to present to English readers the world over all that is best in the Surgery of the Empire, in the brightest and most attractive form. The general dress and appearance of the Journal is of the highest character, and the illustrations are a prominent feature.

"Such a Journal, managed and controlled by a large body of clinical and teaching surgeons, must do much towards bringing about a co-operation of workers in surgery in the advancement of their art. . . . In the matters of printing, illustration, and general get-up, the new journal has been very well served."—*The Lancet.*

"This Journal has been remarkable for the excellence of its illustrations, and those in the present volume form no exception."—*Brit. Med. Jour.*

"An imposing quarterly symposium. . . . A word of special praise is due to the illustrations in colour: they are wholly admirable, and surpass the standard usually attained in medical periodicals."—*Med. Press and Circular.*

Published Quarterly, in May, August, November, and February.

Subscription **30**/– *net per annum, post free. Single Numbers* **8**/**6** *net. Volumes commence in May.*

THE JOURNAL OF NEUROLOGY AND PSYCHOPATHOLOGY.

ISSUED UNDER THE DIRECTION OF THE FOLLOWING EDITORIAL COMMITTEE:

Neurology	Psychopathology
S. A. KINNIER WILSON	BERNARD HART
T. GRAHAM BROWN	HENRY DEVINE
R. M. STEWART	MAURICE NICOLL
C. P. SYMONDS	C. STANFORD READ

CAREY F. COOMBS (BRISTOL), *Editorial Secretary.*

As compared with Continental countries and America, British medical journalism has been slow to deal in adequate fashion with the advances of the last decennium in our knowledge of Nervous and Mental Disease. The JOURNAL OF NEUROLOGY AND PSYCHOPATHOLOGY is devoted to the furtherance of knowledge along entirely modern lines in all that pertains to the nervous system, and comprises:—

1. Original Papers dealing with Neurology and Psychology and any of their branches—Neurophysiology, Neuropathology, Psychotherapy, and so on.
2. Short Papers and Clinical Notes on cases of neurological or psychopathological importance.
3. Editorial Comment on Current Topics bearing on the matters with which the Journal is concerned.
4. Special Critical Reviews and Digests on subjects of neurological and psychological interest whereby the reader will be kept abreast of the most recent research and expressions of opinion.
5. Selected Abstracts of British and Foreign Contributions to neurology and psychology and their various subdivisions, including endocrinology, from current literature, and Reviews of recent books and monographs.

The general practitioner is increasingly aware of the very large part which the nervous system —using the term in its fullest meaning—plays in the causation of those disorders which he is daily called upon to treat. It will be the endeavour of the Editorial Committee to furnish him with all available means for understanding and correcting these morbid processes.

The Journal will adopt a catholic attitude in regard to divergent and sometimes conflicting trends of opinion and therapy in neurology and psychology, in the conviction that only good can result from public interchange of views. It will be open to receive contributions from any and all of the different schools of thought in nervous and mental work, and will provide a medium for the presentation of these to the profession generally.

JOHN WRIGHT & SONS LTD., PUBLISHERS, BRISTOL.

THE INDEX SERIES IN MEDICINE AND SURGERY.
10% Reduction for the Complete Set of Three Volumes.

Third Edition. Thirty-nine New and Original Coloured Plates, and over 300 Illustrations in the text. Fully detailed General Index containing upwards of 60,000 references. Large 8vo. 932 pp. Bevelled Boards. Burnished Top. 42/- net. Postage 1/3.

AN INDEX OF DIFFERENTIAL DIAGNOSIS OF MAIN SYMPTOMS.

Edited by HERBERT FRENCH, C.B.E., M.A., M.D. Oxon, F.R.C.P. Lond.,
Physician to H.M. Household; Physician and Lecturer, Guy's Hospital, etc.

WITH THE COLLABORATION OF 22 SPECIAL CONTRIBUTORS.

This work aims at being of practical utility whenever difficulty arises in deciding the precise cause of any particular symptom. It covers the whole ground of Medicine and Surgery, and deals with Diagnosis from a unique standpoint. It is an Index in that its articles are arranged in alphabetical order. Whilst the body of the book deals with *Symptoms*, the General Index, containing some 60,000 references, gathers these together under the various *Diseases* in which they occur.

"Having read most of the articles in the book, we have no hesitation in saying it should be in the hands of all practitioners and senior students. . . . The publisher is to be congratulated."—*Brit. Med. Jour.*

"The first edition of this stately volume has been exhausted within three years. . . . The editor has added new articles, revised old ones, and nearly doubled the number of illustrations. These are not only excellently reproduced, but deal with real difficulties in diagnosis."—*Lancet.*

"Beyond question a *tour de force*, and reflects the highest credit upon all concerned in its production. The most remarkable feature in the book is its full index. . . . an essential part of the scheme."—*Practitioner.*

"A notable contribution to modern medicine . . . an immense amount of valuable information. . . . The illustrations are remarkably good, especially the coloured ones, which in other books often are remarkably bad."—*Therap. Gazette.*

Eighth Edition. 1,040 *pp. Fully revised, and with many New Articles. Illustrated. Bevelled Boards. Burnished Top.* 42/- *net. Postage* 1/3.

AN INDEX OF TREATMENT

Edited by ROBERT HUTCHISON, M.D., F.R.C.P., *Physician to the London Hospital;*
and JAMES SHERREN, C.B.E., F.R.C.S., *Surgeon to the London Hospital.*

TOGETHER WITH 87 SPECIAL CONTRIBUTORS.

A COMPLETE GUIDE TO TREATMENT IN A FORM CONVENIENT FOR REFERENCE.

"We cannot do more than recommend it in terms of high laudation; it is a volume that should be in the hands of every practitioner of medicine."—*Brit. Med. Jour.*

"Since we first reviewed this book on its appearance in 1908, six further editions have been issued—a gratifying evidence of success which establishes it beyond the reach of criticism. Its general plan and high standard of excellence are doubtless well known to our readers."—*Lancet.*

Second Edition, fully revised and enlarged, with several New Articles. Bevelled Boards. 784 *pp. Burnished Top.* 30/- *net. Postage* 1/-.

AN INDEX OF PROGNOSIS AND END-RESULTS OF TREATMENT.

Edited by A. RENDLE SHORT, M.D., B.S., B.Sc. Lond., F.R.C.S. Eng.,
Lecturer on Physiology, University of Bristol; Asst. Surg., Bristol Royal Infirmary; Examiner in Physiology, First F.R.C.S.

IN CONJUNCTION WITH 24 SPECIAL CONTRIBUTORS.

The principal aims of this Volume are: (1) To set forth the Results, and particularly the End-results, of various methods of Treatment, in such a form as will enable the Practitioner to obtain a fair, unbiased, reasoned opinion as to the prospects of securing for his patient permanent relief, and the risks of such treatment; (2) To furnish data by means of which, apart from the question of Treatment, one may seek to arrive at an accurate forecast of what will probably happen to the individual patient.

"We have formed a high opinion of the value of the *Index of Prognosis* . . . and desire to commend the work to our readers as one which they would do well to place upon their bookshelves."—*Brit. Med. Jour.*

"The editor and his 24 contributors are to be warmly congratulated upon the result. The articles are short and compact, clearly written, and as comprehensive as it has been practicable to make them."—*Lancet.*

"Truly an original and unique work which should prove of considerable value to the practitioner."—*New York Med. Jour.*

"Its aims cannot fail to appeal to practitioners, for the art of prognosis is vitally important. . . . The usefulness of this work will be unchallenged; as a reference book it is unique."—*Hospital.*

JOHN WRIGHT & SONS LTD., PUBLISHERS, BRISTOL.

THE SYNOPSIS SERIES IN MEDICINE AND SURGERY.

Crown 8vo, 968 pp. **25/-** *net. Postage* **1/-**.

SYNOPSIS OF MEDICINE.

By H. LETHEBY TIDY, M.A., M.D. B.Ch. (Oxon.), F.R.C.P. (Lond.),
Assistant Physician, St. Thomas's Hospital; Physician, Great Northern Central Hospital.

"We can say without hesitation that the book is far ahead of any medical synopsis it has been our lot to encounter."—*Lancet.*

Fifth Edition. Crown 8vo, 628 pp. Fully Revised and Enlarged. Illustrated with Numerous Diagrams. **17/6** *net. Postage* **9d.**

SYNOPSIS OF SURGERY.

By ERNEST W. HEY GROVES, M.S., M.D., B.Sc. (Lond.), F.R.C.S. (Eng.),
Surgeon, Bristol General Hospital; Examiner in Surgery, University of London, etc., etc.

"May be regarded as complete in its range of subjects . . . the author is to be congratulated on its readableness, its lucidity, and its fullness—notable qualities."—*British Medical Journal.*

JUST PUBLISHED. SECOND EDITION. Crown 8vo. **15/-** *net. Postage* **9d.**

SYNOPSIS OF MIDWIFERY.

By ALECK W. BOURNE, B.A., M.B., B.C. (Camb.), F.R.C.S. (Eng.),
Obstetric Surgeon to In-patients, Queen Charlotte's Hospital; Obstetric Surgeon to Out-patients, St. Mary's Hospital.

"Based upon the best-known text-books, its teaching is not likely to lead the student astray."—*Lancet.*

10% Reduction for the Complete Set of the above Three Volumes.

Third Edition, Fully Revised. Demy 8vo, 79 Illustrations, 44 in Colour. With a Photogravure of the late Author. **12/6** *net. Postage* **9d.**

DISEASES OF THE THROAT, NOSE, AND EAR.

FOR PRACTITIONERS AND STUDENTS.

By the late W. G. PORTER, M.B., B.Sc., F.R.C.S. Ed.
FULLY REVISED BY A. LOGAN TURNER, M.D. Ed., M.B., C.M., F.R.C.S. Ed.,
Consulting Surgeon, Edinburgh Eye, Ear, and Throat Infirmary, Etc.
AND OTHER COLLABORATORS.

"We know of no manual of its size better suited to the needs of the general practitioner."—*British Medical Journal.*

Demy 8vo. Profusely Illustrated. **17/6** *net. Postage* **9d.**

OTO-RHINO-LARYNGOLOGY.

FOR THE STUDENT AND PRACTITIONER.

By DR. GEORGES LAURENS.

With 592 striking Diagrams and Figures in the Text.

AUTHORIZED ENGLISH TRANSLATION OF THE SECOND REVISED FRENCH EDITION

By H. CLAYTON FOX, F.R.C.S.
Aural Surgeon, Ministry of Pensions, London Area; First Assistant, Throat Department, Brompton Hospital.

In this work detail is carried to the last degree of refinement, and the practitioner will be surprised at the minuteness with which his every touch is described for him. The absolute profusion of illustration makes all points doubly clear. The differentiation drawn between "What to do," and "What not to do," should render his proceedings essentially safe.

"The most profusely illustrated surgical handbook that we have seen; there is hardly a page that is not illustrated by from one to four excellent and pertinent diagrams. . . . The author is to be congratulated on the success that has followed his endeavours. . . . Should prove a welcome aid to all practitioners having any interest in aural work."—*London Hospital Gazette.*